## Opening Thoughts

Options for Answering Warming Advantages —

Solvency attacks — not enough, alt. causes, necessary vs. sufficient, etc.

Impact attacks — NBD, we can adapt, etc.

Science attacks — not real, not human-caused, etc.

Lukewarmers vs. Skeptics —

https://www.theguardian.com/science/2015/may/03/climate-change-scepticism-denial-lukewarmers

<http://www.globalwarming.org/2015/01/22/lukewarmer-matt-ridley-on-how-to-debate-climate-change/>

<https://www.theguardian.com/environment/climate-consensus-97-per-cent/2015/may/13/lukewarmers-the-third-stage-of-climate-denial>

The Importance of Specific Evidence —

Happer: https://www.theguardian.com/environment/2015/dec/08/greenpeace-exposes-sceptics-cast-doubt-climate-science

Mendelsohn: <http://thinkprogress.org/climate/2009/01/11/203535/voodoo-economists-robert-mendelsohn/>

Evans: <https://debunkingdenialism.com/2012/06/23/a-torrent-of-errors-in-david-evans-case-against-global-warming/>

Spencer: <http://thinkprogress.org/climate/2011/07/29/282584/climate-scienists-debunk-latest-bunk-by-denier-roy-spencer/>, https://www.theguardian.com/environment/climate-consensus-97-per-cent/2014/oct/21/global-warming-contrarian-paper-unrealistic-inaccurate

Helpful Resources for finding skeptic answers —

https://en.wikipedia.org/wiki/Skeptical\_Science

<http://www.desmogblog.com/slamming-the-climate-skeptic-scam>

BTW, a potentially helpful article: <https://the3nr.com/2010/10/09/tips-for-answering-global-warming-impacts/>

## Activity

Our warming materials aren’t very good. Let’s make them better.

1. An in-lab mini-debate is scheduled for 8:15PM. In it, the affirmative will defend the climate change module of the US-China relations advantage. The negative will attempt to defeat it using only warming-related arguments (not solvency arguments higher up the advantage’s stem).

2. In preparation for this debate, both sides will have an opportunity to improve our materials. Students will be divided into two groups (aff and neg). They will then receive a specified chunk of time in which to do original research to supplement the camp’s existing climate materials.

3. The format of the debate is as follows:

1AC — 2 minutes

CX of 1AC — 1 minute

1NC — 1 minute 30 seconds

CX of 1NC — 1 minute

2NC — 2 minutes

CX of 2NC — 1 minute

1AR — 1 minute

2NR — 1 minute

2AR — 1 minute

4. After ensuring that it is balanced, we will release a supplemental file of the new materials that we have produced tonight so that they can be used for the rest of camp.

## Packet Aff Materials

### US-China Relations – Climate Change Module

#### US-Sino ties are key to harmonize approaches to check *climate change*

Rudd ‘15

Kevin Rudd, President of the Asia Society Policy Institute and former Prime Minister of Australia. In February 2014, he was named a Senior Fellow with John F. Kennedy School of Government at Harvard University, where he completed a major research effort on the future of China-United States relations. – “The 'New Normal' of Bilateral Relationships” – Beijing Review - NO. 21 - May 18, 2015 - http://www.bjreview.com.cn/print/txt/2015-05/18/content\_688317.htm

If the [United States and China] can conclude the bilateral investment treaty, this will be a huge impetus. Regionally, there are significant differences in terms of different territorial claims in areas around China's coast, in the East China Sea and the South China Sea. Globally, great cooperation has already begun in the area of climate change. But I conclude with this. If the two governments have a strategic framework to manage their differences, and to expand their areas of cooperation, they may in time discover that they have in the 21st century a combined purpose. What is that combined purpose? There are so many threats out there common to China and common to the United States, that they start to be much larger than any disagreements China might have with the United States, or the United States may have with China. When I look at terrorism, it's an external threat to China and to the United States, and to all civilized peoples. It's a threat to order. When I look also at other areas, we've mentioned, of course, the problem of climate change, but then, its offshoots such as food insecurity and water insecurity. And the list goes on. External threats to financial stability, external threats to other forms of stability as well. So my argument is that if we focus on the things that unite rather than the things that divide, there will be a large unleashing of political energy to deal with underlying problems in the relationship as well.

#### US-Sino ties can break global inaction – together, the two nations can galvanize many allies.

Florick ‘15

et al; Davis Florick is a master's candidate in East-West Studies at Creighton University. His areas of concentration include, but are not limited to. East Asia and former Warsaw Pact and Soviet Union states. He was recently interviewed, in print, by Voice of America regarding North Korean tunnels under the Demilitarized Zone and. on television, with Consider This... where he discussed the recent upheaval in Ukraine. He has also been published in International Affairs Forum, the World Business Institute. and previously in International Affairs Review. “Remapping U.S.-China Relations: A Holistic Approach to Building Long-Term Confidence and Transparency” – International Affairs Review - Volume XXIII, Number 3 • Summer 2015 – available at: http://www.iar-gwu.org/sites/default/files/articlepdfs/China%20Special%20Issue%20DOC%20C%20-%2002%20Remapping%20US-China%20Relations%20-%20Florick%20and%20Cronkleton.pdf

Perhaps no two countries have a greater impact on energy and environmental security strategy than China and the United States. China finds itself in an incredibly resource constrained environment without the necessary environmental and resource management capabilities. Moreover, the consequences of environmental degradation are not limited to any particular location and must be solved multilaterally to shape not only the United States and China's own domestic policies, but also those of their global partners and allies. Beijing and Washington's advocacy for things such as resource preservation and environmental sustainability is vital to raising awareness and funding. The long-term commitment required to solve these systemic issues further necessitates U.S.-Chinese cooperation. By developing joint resolutions, Beijing and Washington will stand a much better opportunity of garnering international support for real, positive change.

#### Climate Change is real and anthropogenic

EDF ‘9

[Environmental Defense Fund, a US-based nonprofit environmental advocacy group, “Global Warming Myths and Facts,” 1/13/2009, http://mrgreenbiz.wordpress.com/2009/01/13/global-warming-myths-and-facts-2/]

**There is no debate among scientists about the basic facts of global warming**. The most respected scientific bodies have stated unequivocally that global **warming is occurring, and people are causing it** by burning fossil fuels (like coal, oil and natural gas) and cutting down forests. The U.S. National Academy of Sciences, which in 2005 the White House called "the gold standard of objective scientific assessment," issued a joint statement with 10 other National Academies of Science saying "the scientific understanding of climate change is now sufficiently clear to justify nations taking prompt action. It is vital that all nations identify cost-effective steps that they can take now, to contribute to substantial and long-term reduction in net global greenhouse gas emissions." (Joint Statement of Science Academies: Global Response to Climate Change [PDF], 2005) The only debate in the science community about global warming is about how much and how fast warming will continue as a result of heat-trapping emissions. Scientists have given a clear warning about global warming, and we have more than enough facts — about causes and fixes — to implement solutions right now. MYTH Even if global warming is a problem, addressing it will hurt American industry and workers. FACT A well designed trading program will harness American ingenuity to decrease heat-trapping pollution cost-effectively, jumpstarting a new carbon economy. Claims that fighting global warming will cripple the economy and cost hundreds of thousands of jobs are unfounded. In fact, companies that are already reducing their heat-trapping emissions have discovered that cutting pollution can save money. The cost of a comprehensive national greenhouse gas reduction program will depend on the precise emissions targets, the timing for the reductions and the means of implementation. An independent MIT study found that a modest cap-and-trade system would cost less than $20 per household annually and have no negative impact on employment. Experience has shown that properly designed emissions trading programs can reduce compliance costs significantly compared with other regulatory approaches. For example, the U.S. acid rain program reduced sulfur dioxide emissions by more than 30 percent from 1990 levels and cost industry a fraction of what the government originally estimated, according to EPA. Furthermore, a mandatory cap on emissions could spur technological innovation that could create jobs and wealth. Letting global warming continue until we are forced to address it on an emergency basis could disrupt and severely damage our economy. It is far wiser and more cost-effective to act now. MYTH Water vapor is the most important, abundant greenhouse gas. So if we’re going to control a greenhouse gas, why don’t we control it instead of carbon dioxide (CO2)? FACT Although water vapor traps more heat than CO2, because of the relationships among CO2, water vapor and climate, to fight global warming nations must focus on controlling CO2. Atmospheric levels of CO2 are determined by how much coal, natural gas and oil we burn and how many trees we cut down, as well as by natural processes like plant growth. Atmospheric levels of water vapor, on the other hand, cannot be directly controlled by people; rather, they are determined by temperatures. The warmer the atmosphere, the more water vapor it can hold. As a result, water vapor is part of an amplifying effect. Greenhouse gases like CO2 warm the air, which in turn adds to the stock of water vapor, which in turn traps more heat and accelerates warming. Scientists know this because of satellite measurements documenting a rise in water vapor concentrations as the globe has warmed. **The best way to lower temperature and** thus reduce **water vapor levels is to reduce CO2 emissions.** MYTH Global warming and extra CO2 will actually be beneficial — they reduce cold-related deaths and stimulate crop growth. FACT **Any beneficial effects will be far outweighed by damage and disruption.** Even a warming in just the middle range of scientific projections would have devastating impacts on many sectors of the economy. Rising seas would inundate coastal communities, contaminate water supplies with salt and increase the risk of flooding by storm surge, affecting tens of millions of people globally. Moreover, extreme weather events, including heat waves, droughts and floods, are predicted to increase in frequency and intensity, causing loss of lives and property and throwing agriculture into turmoil. Even though higher levels of CO2 can act as a plant fertilizer under some conditions, scientists now think that the "CO2 fertilization" effect on crops has been overstated; in natural ecosystems, the fertilization effect can diminish after a few years as plants acclimate. Furthermore, increased CO2 may benefit undesirable, weedy species more than desirable species. Higher levels of CO2 have already caused ocean acidification, and scientists are warning of potentially devastating effects on marine life and fisheries. Moreover, higher levels of regional ozone (smog), a result of warmer temperatures, could worsen respiratory illnesses. Less developed countries and natural ecosystems may not have the capacity to adapt. The notion that there will be regional “winners” and “losers” in global warming is based on a world-view from the 1950’s. We live in a global community. Never mind the moral implications — when an environmental catastrophe creates millions of refugees half-way around the world, Americans are affected. MYTH Global warming is just part of a natural cycle. The Arctic has warmed up in the past. FACT The global warming we are experiencing is not natural. **People are causing it**. People are causing global warming by burning fossil fuels (like oil, coal and natural gas) and cutting down forests. Scientists have shown that these activities are pumping far more CO2 into the atmosphere than was ever released in hundreds of thousands of years. **This buildup of CO2 is the biggest cause of global warming**. Since 1895, scientists have known that CO2 and other greenhouse gases trap heat and warm the earth. As the warming has intensified over the past three decades, scientific scrutiny has increased along with it. Scientists have considered and ruled out other, natural explanations such as sunlight, volcanic eruptions and cosmic rays. (IPCC 2001) Though natural amounts of CO2 have varied from 180 to 300 parts per million (ppm), today's CO2 levels are around 380 ppm. That's 25% more than the highest natural levels over the past 650,000 years. Increased CO2 levels have contributed to periods of higher average temperatures throughout that long record. (Boden, Carbon Dioxide Information Analysis Center) As for previous Arctic warming, it is true that there were stretches of warm periods over the Arctic earlier in the 20th century. The limited records available for that time period indicate that the warmth did not affect as many areas or persist from year to year as much as the current warmth. But that episode, however warm it was, is not relevant to the issue at hand. Why? For one, a brief regional trend does not discount a longer global phenomenon. We know that the planet has been warming over the past several decades and Arctic ice has been melting persistently. And unlike the earlier periods of Arctic warmth, there is no expectation that the current upward trend in Arctic temperatures will reverse; the rising concentrations of greenhouse gases will prevent that from happening. MYTH We can adapt to climate change — civilization has survived droughts and temperature shifts before. FACT Although humans as a whole have survived the vagaries of drought, stretches of warmth and cold and more, entire societies have collapsed from dramatic climatic shifts. The current warming of our climate will bring major hardships and economic dislocations — untold human suffering, especially for our children and grandchildren. We are already seeing significant costs from today's global warming which is caused by greenhouse gas pollution. Climate has changed in the past and human societies have survived, but today six billion people depend on interconnected ecosystems and complex technological infrastructure. What's more, **unless we limit the amount of heat-trapping gases we are putting into the atmosphere, we will face a warming trend unseen since human civilization began** 10,000 years ago. (IPCC 2001) The consequences of continued warming at current rates are likely to be dire. Many densely populated areas, such as low-lying coastal regions, are highly vulnerable to climate shifts. A middle-of-the-range projection is that the homes of 13 to 88 million people around the world would be flooded by the sea each year in the 2080s. Poorer countries and small island nations will have the hardest time adapting. (McLean et al. 2001) In what appears to be the first forced move resulting from climate change, 100 residents of Tegua island in the Pacific Ocean were evacuated by the government because rising sea levels were flooding their island. Some 2,000 other islanders plan a similar move to escape rising waters. In the United States, the village of Shishmaref in Alaska, which has been inhabited for 400 years, is collapsing from melting permafrost. Relocation plans are in the works. <continues…> Scarcity of water and food could lead to major conflicts with broad ripple effects throughout the globe. Even if people find a way to adapt, the wildlife and plants on which we depend may be unable to adapt to rapid climate change. While the world itself will not end, the world as we know it may disappear. MYTH Recent cold winters and cool summers don’t feel like global warming to me. FACT While different pockets of the country have experienced some cold winters here and there, the overall trend is warmer winters. Measurements show that over the last century the Earth’s climate has warmed overall, in all seasons, and in most regions. Climate skeptics mislead the public when they claim that the winter of 2003–2004 was the coldest ever in the northeastern United States. That winter was only the 33rd coldest in the region since records began in 1896. Furthermore, a single year of cold weather in one region of the globe is not an indication of a trend in the global climate, which refers to a long-term average over the entire planet. MYTH Global warming can’t be happening because some glaciers and ice sheets are growing, not shrinking. FACT In most parts of the world, the retreat of glaciers has been dramatic. The best available scientific data indicate that Greenland's massive ice sheet is shrinking. Between 1961 and 1997, the world’s glaciers lost 890 cubic miles of ice. The consensus among scientists is that rising air temperatures are the most important factor behind the retreat of glaciers on a global scale over long time periods. Some glaciers in western Norway, Iceland and New Zealand have been expanding during the past few decades. That expansion is a result of regional increases in storm frequency and snowfall rather than colder temperatures — not at all incompatible with a global warming trend. In Greenland, a NASA satellite that can measure the ice mass over the whole continent has found that although there is variation from month to month, over the longer term, the ice is disappearing. In fact, there are worrisome signs that melting is accelerating: glaciers are moving into the ocean twice as fast as a decade ago, and, over time, more and more glaciers have started to accelerate. What is most alarming is the prediction, based on model calculations and historical evidence, that an approximately 5.4 degree Fahrenheit increase in local Greenland temperatures will lead to irreversible meltdown and a sea-level rise of over 20 feet. Since the Arctic is warming 2-3 times faster than the global average, this tipping point is not far away. The only study that has shown increasing ice mass in Greenland only looked at the interior of the ice sheet, not at the edges where melting occurs. This is actually in line with climate model predictions that global warming would lead to a short-term accumulation of ice in the cold interior due to heavier snowfall. (Similarly, scientists have predicted that Antarctica overall will gain ice in the near future due to heavier snowfall.) The scientists who published the study were careful to point out that their results should not be used to conclude that Greenland's ice mass as a whole is growing. In addition, their data suggested that the accumulation of snow in the middle of the continent is likely to decrease over time as global warming continues. MYTH Accurate weather predictions a few days in advance are hard to come by. Why on earth should we have confidence in climate projections decades from now? FACT Climate prediction is fundamentally different from weather prediction, just as climate is different from weather. It is often more difficult to make an accurate weather forecast than a climate prediction. The accuracy of weather forecasting is critically dependent upon being able to exactly and comprehensively characterize the present state of the global atmosphere. Climate prediction relies on other, longer ranging factors. For instance, we might not know if it will be below freezing on a specific December day in New England, but we know from our understanding of the region's climate that the temperatures during the month will generally be low. Similarly, climate tells us that Seattle and London tend to be rainy, Florida and southern California are usually warm, and the Southwest is often dry and hot. Today’s climate models can now reproduce the observed global average climates over the past century and beyond. Such findings have reinforced scientist’s confidence in the capacity of models to produce reliable projections of future climate. Current climate assessments typically consider the results from a range of models and scenarios for future heat-trapping emissions in order to identify the most likely range for future climatic change.

#### The impact is billions of deaths.

Cummins ‘10

(Ronnie, International Director – Organic Consumers Association and Will Allen, Advisor – Organic Consumers Association, “Climate Catastrophe: Surviving the 21st Century”, 2-14, http://www.commondreams.org/view/2010/02/14-6)

The hour is late. Leading climate scientists such as James Hansen are literally shouting at the top of their lungs that the world needs to reduce emissions by 20-40% as soon as possible, and 80-90% by the year 2050, if we are to avoid climate chaos, crop failures, endless wars, melting of the polar icecaps, and a disastrous rise in ocean levels. Either we radically reduce CO2 and carbon dioxide equivalent (CO2e, which includes all GHGs, not just CO2) pollutants (currently at 390 parts per million and rising 2 ppm per year) to 350 ppm, including agriculture-derived methane and nitrous oxide pollution, or else survival for the present and future generations is in jeopardy. As scientists warned at Copenhagen, business as usual and a corresponding 7-8.6 degree Fahrenheit rise in global temperatures means that the carrying capacity of the Earth in 2100 will be reduced to one billion people. Under this hellish scenario, billions will die of thirst, cold, heat, disease, war, and starvation. If the U.S. significantly reduces greenhouse gas emissions, other countries will follow. One hopeful sign is the recent EPA announcement that it intends to regulate greenhouse gases as pollutants under the Clean Air Act. Unfortunately we are going to have to put tremendous pressure on elected public officials to force the EPA to crack down on GHG polluters (including industrial farms and food processors). Public pressure is especially critical since "just say no" Congressmen-both Democrats and Republicans-along with agribusiness, real estate developers, the construction industry, and the fossil fuel lobby appear determined to maintain "business as usual."

### US-Sino ties solves Climate Change

#### US-Sino ties key to global health and green initiatives.

Florick ‘15

et al; Davis Florick is a master's candidate in East-West Studies at Creighton University. His areas of concentration include, but are not limited to. East Asia and former Warsaw Pact and Soviet Union states. He was recently interviewed, in print, by Voice of America regarding North Korean tunnels under the Demilitarized Zone and. on television, with Consider This... where he discussed the recent upheaval in Ukraine. He has also been published in International Affairs Forum, the World Business Institute. and previously in International Affairs Review. “Remapping U.S.-China Relations: A Holistic Approach to Building Long-Term Confidence and Transparency” – International Affairs Review - Volume XXIII, Number 3 • Summer 2015 – available at: http://www.iar-gwu.org/sites/default/files/articlepdfs/China%20Special%20Issue%20DOC%20C%20-%2002%20Remapping%20US-China%20Relations%20-%20Florick%20and%20Cronkleton.pdf

The relationship between the United States and China is unique in the annals of the international system. Holistically, never before have two states with such different cultures emerged as leaders on the world stage. While the United States and China have competing localized and short-term interests, a multitude of strategic incentives motivate them to cooperate, even in the face of obstacles, because "a number of critical problems that the planet and individual nations face cannot be adequately addressed without Sino-American collaboration, among them global economic growth, world health, and environmental issues."1 Cooperation between the two is imperative for the international community to move forward. The challenge is to preserve the focus on strategic priorities despite the tantalizing prospect of pursuing operational opportunities.

#### US-Sino coop key to global solutions on climate change, energy security, food security, and cyberactivity.

Shambaugh ‘15

David Shambaugh is a professor of political science and international affairs at the George Washington University, as well as a non-resident senior fellow at the Brookings Institution. David is regarded inside and outside China as an authority on China's foreign policy, military and security issues and Chinese politics, and has been cited in the state media. He is a regular media commentator, and has acted as an advisor to the United States government and several private foundations and corporations. He was formerly the editor of the China Quarterly, and is a member of the Council on Foreign Relations - “China, U.S. Should Make New Ties” – Brookings, Opinion Section – originally appeared in The China Daily: USA – January 7th – available at: http://www.brookings.edu/research/opinions/2015/01/07-china-us-should-make-new-gains-shambaugh

A third set of issues high on the agenda will be to forge practical cooperation on a number of so-called global governance issues - including counterterrorism, anti-piracy, climate change, maritime security, economic stability, energy security, food security, and setting global rules for cyberactivity. Whether Washington and Beijing work in tandem to address these issues, or work on separate but parallel tracks, such cooperation is critical to addressing these international challenges.

### A-to “Too late – beyond the tipping point”

#### ( ) Not too late – every reduction key

Nuccitelli 12

[Dana, is an environmental scientist at a private environmental consulting firm in the Sacramento, California area. He has a Bachelor's Degree in astrophysics from the University of California at Berkeley, and a Master's Degree in physics from the University of California at Davis. He has been researching climate science, economics, and solutions as a hobby since 2006, and has contributed to Skeptical Science since September, 2010, <http://www.skepticalscience.com/realistically-what-might-future-climate-look-like.html>]

We're not yet committed to surpassing 2°C global warming, but as Watson noted, we are quickly running out of time to realistically give ourselves a chance to stay below that 'danger limit'. However, 2°C is not a do-or-die threshold. Every bit of CO2 emissions we can reduce means that much avoided future warming, which means that much avoided climate change impacts. As Lonnie Thompson noted, the more global warming we manage to mitigate, the less adaption and suffering we will be forced to cope with in the future. Realistically, based on the current political climate (which we will explore in another post next week), limiting global warming to 2°C is probably the best we can do. However, there is a big difference between 2°C and 3°C, between 3°C and 4°C, and anything greater than 4°C can probably accurately be described as catastrophic, since various tipping points are expected to be triggered at this level. Right now, we are on track for the catastrophic consequences (widespread coral mortality, mass extinctions, hundreds of millions of people adversely impacted by droughts, floods, heat waves, etc.). But we're not stuck on that track just yet, and we need to move ourselves as far off of it as possible by reducing our greenhouse gas emissions as soon and as much as possible. There are of course many people who believe that the planet will not warm as much, or that the impacts of the associated climate change will be as bad as the body of scientific evidence suggests. That is certainly a possiblity, and we very much hope that their optimistic view is correct. However, what we have presented here is the best summary of scientific evidence available, and it paints a very bleak picture if we fail to rapidly reduce our greenhouse gas emissions. If we continue forward on our current path, catastrophe is not just a possible outcome, it is the most probable outcome. And an intelligent risk management approach would involve taking steps to prevent a catastrophic scenario if it were a mere possibility, let alone the most probable outcome. This is especially true since the most important component of the solution - carbon pricing - can be implemented at a relatively low cost, and a far lower cost than trying to adapt to the climate change consequences we have discussed here (Figure 4).

### A-to “Warming Not Real”

#### ( ) Global Warming is happening – most recent and best evidence concludes that it is human induced

Muller ‘12

[Richard, professor of physics at the University of California, Berkeley, and a former MacArthur Foundation fellow, “The Conversion of a Climate-Change Skeptic”, http://www.nytimes.com/2012/07/30/opinion/the-conversion-of-a-climate-change-skeptic.html?pagewanted=all]

CALL me a converted skeptic. Three years ago I identified problems in previous climate studies that, in my mind, threw doubt on the very existence of global warming. Last year, following an intensive research effort involving a dozen scientists, I concluded that global warming was real and that the prior estimates of the rate of warming were correct**.** I’m now going a step further: Humans are almost entirely the cause. My total turnaround, in such a short time, is the result of careful and objective analysis by the Berkeley Earth Surface Temperature project, which I founded with my daughter Elizabeth. Our results show that the average temperature of the earth’s land has risen by two and a half degrees Fahrenheit over the past 250 years, including an increase of one and a half degrees over the most recent 50 years. Moreover, it appears likely that essentially all of this increase results from the human emission of greenhouse gases. These findings are stronger than those of the Intergovernmental Panel on Climate Change [IPCC], the United Nations group that defines the scientific and diplomatic consensus on global warming. In its 2007 report, the I.P.C.C. concluded only that most of the warming of the prior 50 years could be attributed to humans. It was possible, according to the I.P.C.C. consensus statement, that the warming before 1956 could be because of changes in solar activity, and that even a substantial part of the more recent warming could be natural. Our Berkeley Earth approach used sophisticated statistical methods developed largely by our lead scientist, Robert Rohde, which allowed us to determine earth land temperature much further back in time. We carefully studied issues raised by skeptics: biases from urban heating (we duplicated our results using rural data alone), from data selection (prior groups selected fewer than 20 percent of the available temperature stations; we used virtually 100 percent), from poor station quality (we separately analyzed good stations and poor ones) and from human intervention and data adjustment (our work is completely automated and hands-off). In our papers we demonstrate that none of these potentially troublesome effects unduly biased our conclusions. The historic temperature pattern we observed has abrupt dips that match the emissions of known explosive volcanic eruptions; the particulates from such events reflect sunlight, make for beautiful sunsets and cool the earth’s surface for a few years. There are small, rapid variations attributable to El Niño and other ocean currents such as the Gulf Stream; because of such oscillations, the “flattening” of the recent temperature rise that some people claim is not, in our view, statistically significant. What has caused the gradual but systematic rise of two and a half degrees? We tried fitting the shape to simple math functions (exponentials, polynomials), to solar activity and even to rising functions like world population. By far the best match was to the record of atmospheric carbon dioxide (CO2), measured from atmospheric samples and air trapped in polar ice.

#### ( ) Neg args are empirically denied- positive feedback loops and biodiversity loss is proven

Lyderson ‘9

(Kari, journalist, Washington Post, “Scientists: Pace of Climate Change Exceeds Estimates” 2/15 – online)

The pace of global warming is likely to be much faster than recent predictions, because industrial greenhouse gas emissions have increased more quickly than expected and higher temperatures are triggering self-reinforcing feedback mechanisms in global ecosystems, scientists said Saturday. "We are basically looking now at a future climate that's beyond anything we've considered seriously in climate model simulations," Christopher Field, founding director of the Carnegie Institution's Department of Global Ecology at Stanford University, said at the annual meeting of the American Association for the Advancement of Science. Field, a member of the United Nations' Intergovernmental Panel on Climate Change, said emissions from burning fossil fuels since 2000 have largely outpaced the estimates used in the U.N. panel's 2007 reports. The higher emissions are largely the result of the increased burning of coal in developing countries, he said. Unexpectedly large amounts of carbon dioxide are being released into the atmosphere as the result of "feedback loops" that are speeding up natural processes. Prominent among these, evidence indicates, is a cycle in which higher temperatures are beginning to melt the arctic permafrost, which could release hundreds of billions of tons of carbon dioxide and methane into the atmosphere, said several scientists on a panel at the meeting. The permafrost holds 1 trillion tons of carbon, and as much as 10 percent of that could be released this century, Field said. Along with carbon dioxide melting permafrost releases methane, which is 25 times more potent a greenhouse gas than carbon dioxide. "It's a vicious cycle of feedback where warming causes the release of carbon from permafrost, which causes more warming, which causes more release from permafrost," Field said. Evidence is also accumulating that terrestrial and marine ecosystems cannot remove as much carbon from the atmosphere as earlier estimates suggested, Field said. In the oceans, warmer weather is driving stronger winds that are exposing deeper layers of water, which are already saturated with carbon and not as able to absorb as much from the atmosphere. The carbon is making the oceans more acidic, which also reduces their ability to absorb carbon. On land, rising carbon dioxide levels had been expected to boost plant growth and result in greater sequestration of carbon dioxide. As plants undergo photosynthesis to draw energy from the sun, carbon is drawn out of the atmosphere and trapped in the plant matter. But especially in northern latitudes, this effect may be offset significantly by the fact that vegetation-covered land absorbs much more of the sun's heat than snow-covered terrain, said scientists on the panel. Earlier snowmelt, the shrinking arctic ice cover and the northward spread of vegetation are causing the Northern Hemisphere to absorb, rather than reflect, more of the sun's energy and reinforce the warming trend. While it takes a relatively long time for plants to take carbon out of the atmosphere, that carbon can be released rapidly by wildfires, which contribute about a third as much carbon to the atmosphere as burning fossil fuels, according to a paper Field co-authored. Fires such as the recent deadly blazes in southern Australia have increased in recent years, and that trend is expected to continue, Field said. Warmer weather, earlier snowmelt, drought and beetle infestations facilitated by warmer climates are all contributing to the rising number of fires linked to climate change. Across large swaths of the United States and Canada, bark beetles have killed many mature trees, making forests more flammable. And tropical rain forests that were not susceptible to forest fires in the past are likely to become drier as temperatures rise, growing more vulnerable. Preventing deforestation in the tropics is more important than in northern latitudes, the panel agreed, since lush tropical forests sequester more carbon than sparser northern forests. And deforestation in northern areas has benefits, since larger areas end up covered in exposed, heat-reflecting snow. Many scientists and policymakers are advocating increased incentives for preserving tropical forests, especially in the face of demand for clearing forest to grow biofuel crops such as soy. Promoting biofuels without also creating forest-preservation incentives would be "like weatherizing your house and deliberately keeping your windows open," said Peter Frumhoff, chief of the Union of Concerned Scientists' climate program. "It's just not a smart policy." Field said the U.N. panel's next assessment of Earth's climate trends, scheduled for release in 2014, will for the first time incorporate policy proposals. It will also include complicated models of interconnected ecosystem feedbacks.

#### ( ) Consensus is on our side

EDF 9.

[ENVIRONMENTAL DEFENSE FUND, 1-13 “GLOBAL WARMING MYTHS AND FACTS” -- <http://www.edf.org/page.cfm?tagID=1011>]

FACT: There is no debate among scientists about the basic facts of global warming. The most respected scientific bodies have stated unequivocally that global warming is occurring, and people are causing it by burning fossil fuels (like coal, oil and natural gas) and cutting down forests. The U.S. National Academy of Sciences, which in 2005 the White House called "the gold standard of objective scientific assessment," issued a joint statement with 10 other National Academies of Science saying "the scientific understanding of climate change is now sufficiently clear to justify nations taking prompt action. It is vital that all nations identify cost-effective steps that they can take now, to contribute to substantial and long-term reduction in net global greenhouse gas emissions." (Joint Statement of Science Academies: Global Response to Climate Change [PDF], 2005) The only debate in the science community about global warming is about how much and how fast warming will continue as a result of heat-trapping emissions. Scientists have given a clear warning about global warming, and we have more than enough facts — about causes and fixes — to implement solutions right now.

### A-to “Warming = Not Anthropogenic”

#### ( ) Scientific consensus proves warming is anthropogenic

Monbiot ‘7

[George, Prof @ Oxford Brookes U, Heat: How to Stop the Planet from Burning p 5]

But the link has also been established directly. A study of ocean warming over the past forty years, for example, published in the journal *Science* in 2005, records a precise match between the distribution of heat and the intensity of manmade carbon dioxide emissions. Its lead author described his findings thus: The evidence is so strong it should put an end to any debate about whether humanity is causing global warming. This sounds like a strong statement, but he is not alone. In 2004, another article in *Science* reported the results of a survey of scientific papers containing the words ‘global climate change’. The author found 928 of them on the database she searched. None of the papers, she discovered, disagreed with the consensus position… Politicians, economists, journalists and others may have the impression of confusion, disagreement, or discord among climate scientists, but that impression is incorrect. In 2001 the Royal Society, the United Kingdom’s pre-eminent scientific institution, published the following statement: Despite increasing consensus on the science underpinning predictions of global climate change, doubts have been expressed recently about the need to mitigate the risks posed by global climate change. We do not consider such doubts justified. It was also signed by the equivalent organizations in fifteen other countries. Similar statements have been published by the US National Academy of Sciences, the American Meteorological Society, the American Geophysical Union and the American Association for the Advancement of Science.

### A-to “Aff = Biased Authors”

#### ( ) Our climate models are the most accurate- studies of studies prove

Science Daily ‘8

(4/6, "Climate Models Look Good When Predicting Climate Change", <http://www.sciencedaily.com/releases/2008/04/080402100001.htm>)

The accuracy of computer models that predict climate change over the coming decades has been the subject of debate among politicians, environmentalists and even scientists. A new study by meteorologists at the University of Utah shows that current climate models are quite accurate and can be valuable tools for those seeking solutions on reversing global warming trends. Most of these models project a global warming trend that amounts to about 7 degrees Fahrenheit over the next 100 years. Scientific opinion on climate change In the study, co-authors Thomas Reichler and Junsu Kim from the Department of Meteorology at the University of Utah investigate how well climate models actually do their job in simulating climate. To this end, they compare the output of the models against observations for present climate. The authors apply this method to about 50 different national and international models that were developed over the past two decades at major climate research centers in China, Russia, Australia, Canada, France, Korea, Great Britain, Germany, and the United States. Of course, also included is the very latest model generation that was used for the very recent (2007) report of the Intergovernmental Panel on Climate Change (IPCC). "Coupled models are becoming increasingly reliable tools for understanding climate and climate change, and the best models are now capable of simulating present-day climate with accuracy approaching conventional atmospheric observations," said Reichler. "We can now place a much higher level of confidence in model-based projections of climate change than in the past." The many hours of studying models and comparing them with actual climate changes fulfills the increasing wish to know how much one can trust climate models and their predictions. Given the significance of climate change research in public policy, the study's results also provide important response to critics of global warming. Earlier this year, working group one of the IPCC released its fourth global warming report. The University of Utah study results directly relate to this highly publicized report by showing that the models used for the IPCC paper have reached an unprecedented level of realism.

#### ( ) Neg authors are worse- they’re just special interest hacks

Hansen ‘6

(Jim. Director of the NASA Goddard Institute for Space Studies, Adjunct Professor of Earth and Environmental Sciences at Columbia University’s Earth Institute. “The Threat to the Planet” The New York Review of Books. Pages 11-12. http://www.pdfdownload.org/pdf2html/pdf2html.php?url=http%3A%2F%2Fwww.astro.columbia.edu%2F~roban%2Flab\_2006\_fall%2Fhansen.pdf&images=yes )

Why are the same scientists and political forces that succeeded in controlling the threat to the ozone layer now failing miserably to deal with the global warming crisis? Though we depend on fossil fuels far more than we ever did on CFCs, there is plenty of blame to go around. Scientists present the facts about climate change clinically, failing to stress that business-as- usual will transform the planet. The press and television, **despite an overwhelming scientific** **consensus concerning global warming**, give equal time to fringe "contrarians" supported by the fossil fuel industry. Special interest groups mount effective disinformation campaigns to sow doubt about the reality of global warming. The government appears to be strongly influenced by special interests, or otherwise confused and distracted, and it has failed to provide leadership. The public is understandably confused or uninterested. I used to spread the blame uniformly until, when I was about to appear on public television, the producer informed me that the program "must" also include a "contrarian" who would take issue with claims of global warming. Presenting such a view, he told me, was a common practice in commercial television as well as radio and newspapers. Supporters of public TV or advertisers, with their own special interests, require "balance" as a price for their continued financial support. Gore's book reveals that while more than half of the recent newspaper articles on climate change have given equal weight to such contrarian views, **virtually none of** **the scientific articles in peer-reviewed journals have questioned the consensus that emissions from human activities cause global warming.** As a result, **even when the scientific evidence is clear, technical nit-picking by contrarians leaves the public with the false impression that there is still great scientific uncertainty about the reality and causes of climate change**.

### A-to “ Species Adapt”

( ) Species can’t adapt- rate of warming is too fast

Costello and Maslin ‘8

[Anthony, Professor of International Child Health and Director of the UCL Institute for Global Health. Mark, Professor UCL Environment Institute. “Apocalypse Now?” – THE LANCET -- 7/12]

Climate change affects all ecosystems. Carbon dioxide will reach two to three times its mid-19th-century level by 2100 leading to major changes in seasonal temperatures and rainfall patterns. Normally with this sort of climate change animals and plants would simply migrate with their preferred climate. However, the rate of human-induced climate change is so rapid that many plant species cannot migrate fast enough and also in many places human beings already occupy the space into which the ecosystem would migrate. Ecosystems most at risk are alpine meadows, cloud forests, arctic tundra, and coral reefs.

#### ( ) Temperature spikes destroy resilience – must slow the rate.

EPA ‘7

[United States Environmental Protection Agency. “Climate Change-health and environmental effects: ecosystems and biodiversity.” http://www.epa.gov/climatechange/effects/ecosystemsandbiodiversity.html -- 12/20]

Observations of ecosystem impacts are difficult to use in future projections because of the complexities involved in human/nature interactions (e.g., land use change). Nevertheless, the observed changes are compelling examples of how rising temperatures can affect the natural world and raise questions of how vulnerable populations will adapt to direct and indirect effects associated with climate change. The IPCC (IPCC, 2007) has noted, During the course of this century the resilience of many ecosystems (their ability to adapt naturally) is likely to be exceeded by an unprecedented combination of change in climate and in other global change drivers (especially land use change and overexploitation), if greenhouse gas emissions and other changes continue at or above current rates. By 2100 ecosystems will be exposed to atmospheric CO2 levels substantially higher than in the past 650,000 years, and global temperatures at least among the highest as those experienced in the past 740,000 years. This will alter the structure, reduce biodiversity and perturb functioning of most ecosystems, and compromise the services they currently provide.

### A-to “Feedbacks Solve”

#### ( ) Feedbacks are net positive

Homer-Dixon ‘7

[Thomas - Centre for International Governance Innovation Chair of Global Systems at the Balsillie School of International Affairs, Professor in the Centre for Environment and Business in the Faculty of Environment at the University of Waterloo, PhD in IR from MIT -- 11/14, Address to the conference for a Globally Integrated Climate Policy for Canada, "Positive Feedbacks, Dynamic Ice Sheets, and the Recarbonization of the Global Fuel Supply: The New Sense of Urgency about Global Warming", http://www.homerdixon.com/articles/excerpt-new\_urgency-thomas\_homer-dixon.pdf]

Let me now say a little bit more about some other feedbacks. This is one of the punch lines of my presentation today. I mentioned earlier that there are two general kinds of feedback: those that operate more- or-less directly on temperature, such as the ice-albedo feedback, and those that operate on Earth’s carbon cycle, where warming produces a change in the amount of carbon in the atmosphere. We have a fairly good understanding of the former and not such a good understanding of the latter. One carbon feedback that worries scientists involves the melting of the permafrost in Siberia, Alaska, and Northern Canada. As the permafrost melts it releases large quantities of methane – a very powerful greenhouse gas that, in turn, causes more warming. Scientists are also concerned about the potential release of more carbon dioxide from forests: just yesterday researchers reported evidence that, as the climate has warmed, the Canadian boreal forest has gone from being a carbon sink to a slight carbon emitter. And then there’s the matter of pine bark beetles. As you likely know, we’ve lost wide swaths of pine forest in British Columbia and Alaska – huge areas of trees – to bark-beetle infestation. As the climate warms, bark-beetle populations reproduce through two generations during the summer, and beetle mortality is lower during the winter. Both these changes mean that beetle populations become much larger overall. If these larger populations cross the Rockies and get into the boreal forest that stretches from Alberta to Newfoundland, and if they kill that forest, the forest will be susceptible to fire that could release astounding quantities of carbon dioxide. I asked Stephen Schneider, a leading cli- mate scientist at Stanford, about the implications of such a develop- ment. He just shrugged and said, ‘well, we’re talking about billions of tonnes of carbon.’ Other potentially destabilizing carbon-cycle feedbacks include the drying of the Amazon and the possibility that if it dries it will burn; the drying of peat bogs in Indonesia, which have already been susceptible to wide-spread burning; and the saturation of ocean carbon sinks. The Southern Ocean around Antarctica is no longer absorbing carbon diox- ide to the extent it did in the past. Warming has produced much more vigorous winds closer to Antarctica. These winds have churned up the sea and brought to the surface deep carbon-rich water, which absorbs less carbon from the atmosphere. Also, higher levels of carbon dioxide in the atmosphere are acidifying the oceans, a change could reduce populations of molluscs and phytoplankton that absorb carbon into the calcium carbonate of their shells. Our climate has both positive and negative feedbacks. The positive ones are self-reinforcing, and the negative ones equilibrate the climate and counteract the tendency towards self-reinforcing climate change. The big question for climate scientists then is: What is the balance is between the positive and negative feedbacks? A consensus has emerged over the last two years – a consensus again not reflected in the recent IPCC reports – that the positive feedbacks in the climate system are much stronger and more numerous than the negative feedbacks. In a paper published last year in Geophysical Research Letters, Scheffer, Brovkin, and Cox carried out a comprehensive assessment of the feed- back situation.7 They wrote, ‘[we] produce an independent estimate of the potential implications of the positive feedback between global tem- peratures and greenhouse gasses.’ In other words, these researchers focused specifically on carbon cycle feedbacks. They went on, ‘we sug- gest that feedback of global temperature and atmosphere CO2 will promote warming by an extra 15% to 78% on a century scale over and above the IPCC estimates.’ Let’s turn to the issue of dynamic ice sheets. The Greenland ice sheet is the second largest mass of ice in the world, after that in Antarctica. If we melt Greenland entirely, we get seven metres of sea-level rise. If we melt the West Antarctic ice sheet, we get another five metres. If we melt the rest of Antarctica, we get an additional fifty or so metres. The Greenland ice sheet will probably be the first to melt, because it’s the most vulnerable. During the last interglacial period 125,000 years ago, when temperatures were roughly what they’re going to be at the end of this century, much of Greenland melted, and sea levels were four to six metres higher than they are right now.

## Packet Neg Materials

### 1NC Frontline

#### ( ) Warming not real- recent temperatures show no increase

Happer ‘12

(William is a professor of physics at Princeton. “Global Warming Models Are Wrong Again”, Wall Street Journal, 3/27/12, <http://online.wsj.com/article/SB10001424052702304636404577291352882984274.html>)

What is happening to global temperatures in reality? The answer is: almost nothing for more than 10 years. Monthly values of the global temperature anomaly of the lower atmosphere, compiled at the University of Alabama from NASA satellite data, can be found at the website http://www.drroyspencer.com/latest-global-temperatures/. The latest (February 2012) monthly global temperature anomaly for the lower atmosphere was minus 0.12 degrees Celsius, slightly less than the average since the satellite record of temperatures began in 1979

#### ( ) Climate impact exaggerated ---mitigation and adaptation will solve

Mendelsohn ‘9

(Robert O. Mendelsohn, the Edwin Weyerhaeuser Davis Professor, Yale School of Forestry and Environmental Studies, Yale University, June 2009, “Climate Change and Economic Growth,” online: <http://www.growthcommission.org/storage/cgdev/documents/gcwp060web.pdf>)

These statements are largely alarmist and misleading. Although climate change is a serious problem that deserves attention, society’s immediate behavior has an extremely low probability of leading to catastrophic consequences. The science and economics of climate change is quite clear that emissions over the next few decades will lead to only mild consequences. The severe impacts predicted by alarmists require a century (or two in the case of Stern 2006) of no mitigation. Many of the predicted impacts assume there will be no or little adaptation. The net economic impacts from climate change over the next 50 years will be small regardless. Most of the more severe impacts will take more than a century or even a millennium to unfold and many of these “potential” impacts will never occur because people will adapt. It is not at all apparent that immediate and dramatic policies need to be developed to thwart long‐range climate risks. What is needed are long‐run balanced responses.

#### ( ) Warming evidence skewed – urban heat island

Evans ‘12

(David has a PhD in electrical engineering, worked from 1999 to 2006 for the Australian Greenhouse Office, an agency of the Australian government, designing a carbon accounting system- Financial Post, "Global Warming Theory Is Based on False Science.", 7 Apr. 2011, infotrac)

There are now several independent pieces of evidence showing that the earth responds to the warming due to extra carbon dioxide by dampening the warming. Every long-lived natural system behaves this way, counteracting any disturbance. Otherwise the system would be unstable. The climate system is no exception, and now we can prove it. But the alarmists say the exact opposite, that the climate system amplifies any warming due to extra carbon dioxide, and is potentially unstable. It is no surprise that their predictions of planetary temperature made in 1988 to the U.S. Congress, and again in 1990, 1995, and 2001, have all proved much higher than reality. They keep lowering the temperature increases they expect, from 0.30C per decade in 1990, to 0.20C per decade in 2001, and now 0.15C per decade—yet they have the gall to tell us "it's worse than expected." These people are not scientists. They overestimate the temperature increases due to carbon dioxide, selectively deny evidence, and now they conceal the truth. One way they conceal is in the way they measure temperature. The official thermometers are often located in the warm exhaust of air conditioning outlets, over hot tarmac at airports where they get blasts of hot air from jet engines, at waste-water plants where they get warmth from decomposing sewage, or in hot cities choked with cars and buildings. Global warming is measured in 10ths of a degree, so any extra heating nudge is important. In the United States, nearly 90% of official thermometers surveyed by volunteers violate official siting requirements that they not be too close to an artificial heating source. Global temperature is also measured by satellites, which measure nearly the whole planet 24/7 without bias. The satellites say the hottest recent year was 1998, and that since 2001 the global temperature has levelled off. Why does official science track only the surface thermometer results and not mention the satellite results?

#### ( ) Not anthropogenic – multiple warrants

Spencer ‘12

(Roy, former NASA climatologist and author, “Ten Years After the Warming,” 2/26, <http://www.drroyspencer.com/2012/02/>)

As can be seen, in the last 10 years the estimated forcing has been the strongest. Yet, most if not all temperature datasets show little or no global-average warming recently, either in the atmosphere, at the surface, or in the upper 700 meters of the ocean. For example, here are the tropospheric temperatures up though a few days ago: So what is happening? You cannot simply say a lack of warming in 10 years is not that unusual, and that there have been previous 10-year periods without warming, too. No, we are supposedly in uncharted territory with a maximum in radiative forcing of the climate system. One cannot compare on an equal basis the last 10 years with any previous decades without warming. There are 5 possibilities for the recent cessation of warming which are most discussed: 1) cooling from anthropogenic aerosols has been cancelling out warming from more greenhouse gases 2) natural cooling from internal climate fluctuations or the sun is cancelling out the GHG warming 3) increased ocean mixing is causing the extra energy to be distributed into the deep ocean 4) the temperature ’sensitivity’ of the climate system is not as large as the IPCC assumes. 5) there is something fundamentally wrong with the GHG warming theory itself Of course, some combination of the above 5 explanations is also possible. The 1st possibility (aerosol cooling is cancelling out GHG forcing) is one of the more popular explanations with the climate modelers, and especially with NASA’s James Hansen. The uncertain strength (and even sign) of aerosol forcing allows the climate modelers to use aerosols as a tuning knob (aka fudge factor) in making their models produce warming more-or-less consistent with past observations. Using an assumed large aerosol cooling to cancel out the GHG warming allows the modelers to retain high climate sensitivity, and thus the fear of strong future warming if those aerosols ever dissipate. The 2nd possibility (natural cooling) is a much less desirable explanation for the IPCC crowd because it opens the door to Mother Nature having as much or more influence on the climate system than do humans. We can’t have that, you know. Then you would have to consider the possibility that most of the warming in the last 50 years was natural, too. Goodbye, AGW funding. The 3rd possibility (increased ocean mixing) is one of the more legitimate possibilities, at least theoretically. It’s popular with NCAR’s Kevin Trenberth. But one would need more observational evidence this is happening before embracing the idea. Unfortunately, how vertical mixing in the ocean naturally varies over time is poorly understood; the different IPCC models have widely varying strengths of mixing, and so ocean mixing is a huge wild card in the global warming debate, as is aerosol cooling. I believe much of past climate change on time scales of decades to many centuries might be due to such variations in ocean mixing, along with their likely influence on global cloud cover changing the amount of solar input into the climate system. The 4th possibility (the climate system is relatively insensitive to forcing) is the top contender in the opinion of myself, Dick Lindzen, and a few other climate researchers who work in this field. The 5th possibility (increasing GHGs don’t really cause warming) is total anathema to the IPCC. Without GHG warming, the whole AGW movement collapses. This kind of scientific finding would normally be Nobel Prize territory…except that the Nobel Prize has become more of a socio-political award in recent years, with only politically correct recipients. The self-flagellating elites don’t like the idea humans might not be destroying the Earth. The longer we go without significant warming, the more obvious it will become that there is something seriously wrong with current AGW theory. I don’t think there is a certain number of years – 5, 10, 20, etc. – which will disprove the science of AGW….unless the climate system cools for the next 10 years. Eek! But I personally doubt that will happen.

#### ( ) Feedbacks are net negative

Spencer ‘8

(Roy W. Ph.D., climatologist, author, former NASA scientist, “Satellite and Climate Model Evidence Against Substantial Manmade Climate Change (supercedes “Has the Climate Sensitivity Holy Grail Been Found?”)”, Roy W. Spencer, 12/27/08, <http://www.drroyspencer.com/research-articles/satellite-and-climate-model-evidence/>)

The comparisons modelers make between their models and satellite data are typically rather crude and cursory. They are not sufficiently detailed to really say anything of substance about feedbacks — in either the models or the satellite data – and yet it is the feedbacks that will determine how serious the manmade global warming problem will be. And as I have tried to demonstrate here, the main reason for the current inadequacy of such methods of comparison between models and observations is the contaminating effect of clouds causing temperatures to change (forcing) when trying to estimate how temperatures cause clouds to change (feedback). This not a new issue, as it has been addressed by Forster and Gregory (2006, applied to satellite measurements) and Forster and Taylor (2006, applied to climate model output). I have merely demonstrated that the same contamination occurs from internal fluctuations in clouds in the climate system. The bottom line from the model and observational evidence presented here is that: Net feedbacks in the real climate system — on both short and long time scales — are probably negative. A misinterpretation of cloud behavior has led climate modelers to build models in which cloud feedbacks are instead positive, which has led the models to predict too much global warming in response to anthropogenic greenhouse gas emissions.

### Extensions – No Warming

#### ( ) No warming – models are wrong, feedbacks are negative and its cyclical

Evans ‘11

(David, doctor in electrical engineering, worked from 1999 to 2006 for the Australian Greenhouse Office, an agency of the Australian government, designing a carbon accounting system, “Climate models are fundamentally flawed as they greatly overestimate the temperature increases due to carbon dioxide,” 3/23, <http://www.ted.com/conversations/2533/climate_models_are_fundamental.html>)

The core idea of every official climate model: for each bit of warming due to carbon dioxide, it ends up causing three bits of warming due to the extra moist air. The climate models amplify the carbon dioxide warming by a factor of three – so two thirds of their projected warming is due to extra moist air (and other factors), only one third is due to extra carbon dioxide. This is the core of the issue. All the disagreements spring from this. The alarmist case is based on this guess about moisture in the atmosphere. There is simply no evidence for the amplification that is at the core of their alarmism. Weather balloons had been measuring the atmosphere since the 1960’s. The climate models all predict that as the planet warms, a hot-spot of moist air will develop over the tropics about 10km up. Weather balloons have found no hot-spot. Not even a small one. This evidence proves the climate models are fundamentally flawed and they greatly overestimate the temperature increases due to carbon dioxide. There are now several independent pieces of evidence showing that the earth responds to the warming due to extra carbon dioxide by dampening the warming. In the US, nearly 90% of official thermometers surveyed by volunteers violate official siting requirements that they not be too close to an artificial heating source. Global temperature is also measured by satellites, which measure nearly the whole planet 24/7 without bias. The satellites say the hottest recent year was 1998, and that since 2001 the global temperature has leveled off. So what is really going on with the climate? The earth has been in a warming trend since the Little Ice Age around 1680. The Pacific Decadal Oscillation causes alternating global warming and cooling for 25 – 30 years at a go in each direction. Having just finished a warming phase, expect mild global cooling for the next two decades.

#### ( ) Aerosols block warming now

Biello ‘11

(David Biello- award-winning online associate editor for environment and energy for Scientific American- Stratospheric Pollution Helps Slow Global Warming-July 11 2011- [http://www.scientificamerican.com/article.cfm?id=stratospheric-pollution-helps-slow-global-warming](http://www.drroyspencer.com/research-articles/satellite-and-climate-model-evidence/?id=stratospheric-pollution-helps-slow-global-warming))

Now, research suggests that for the past decade, such stratospheric aerosols—injected into the atmosphere by either recent volcanic eruptions or human activities such as coal burning—are slowing down [global warming](http://wattsupwiththat.com/2012/01/08/new-paper-agw-may-save-us-from-the-next-ice-age/?id=global-warming-and-climate-change). "Aerosols acted to keep warming from being as big as it would have been," says atmospheric scientist John Daniel of the National Oceanic and Atmospheric Administration's (NOAA) Earth System Research Laboratory, who helped lead the [research published online in *Science*](http://www.popsci.com/science/article/2012-01/human-co2-emissions-could-avert-next-ice-age-study-says) on July 21. "It's still warming, it's just not warming as much as it would have been." Essentially, sulfur dioxide gets emitted near the surface, either by a coal-fired power plant's smokestack or a volcano. If that SO2 makes it to the stratosphere—the middle layer of the atmosphere 10 kilometers up—it forms droplets of diluted sulfuric acid, known as [aerosols](http://en.wikipedia.org/wiki/Aerosol). These aerosols reflect sunlight away from the planet, shading the surface and cooling temperatures. And some can persist for a few years, prolonging that cooling. By analyzing satellite data and other measures, Daniel and his colleagues found that such aerosols have been on the rise in Earth's atmosphere in the past decade, nearly doubling in concentration. That concentration has reflected roughly 0.1 watts per meter squared of sunlight away from the planet, enough to o/ffset roughly one-third of the 0.28 watts per meter squared of extra heat trapped by [rising atmospheric concentrations of greenhouse gases](http://www.scientificamerican.com/blog/post.cfm?id=a-24-degree-c-rise-by-2020-probably-2011-01-20) such as carbon dioxide. The researchers calculate that the aerosols prevented 0.07 degrees Celsius of warming in average temperatures since 2000.

#### ( ) Temperatures this decade have balanced out- no changes

Totty ‘9

Michael Totty, 2009 news editor in the WSJ's San Francisco bureau. reporter, editor and podcaster ([http://online.wsj.com/article/SB10001424052748703819904574551303527570212](http://standeyo.com/Reports/Ice_age/050614.ice.age.html).html) Wall Street Journal, “What Global Warming?”, December 6, 2009)

But this isn't evidence of a cooling planet. Partly, it's a result of picking an exceptionally hot year—1998—as a starting point. That year experienced an unusually strong El Niño, a natural and periodic warming of the Pacific Ocean that can have powerful effects on global climate. The long-term trend since the mid-1970s shows warming per decade of about 0.18 degree Celsius (about 0.32 degree Fahrenheit). That temperatures this decade have hardly increased demonstrates how natural year-to-year variations in climate can either add to or subtract from the long-term warming trend caused by the increase in greenhouse gases in the atmosphere. The '00s still have been exceptionally warm: The 12 years from 1997 through 2008 were among the 15 warmest on record, and the decade itself was hotter than any previous 10-year period. While 2008 was the coolest year since 2000—a result of the cooling counterpart of El Niño—it was still the 11th-warmest year on record. And 2009 is on track to be among the five warmest.

### Extensions – Not Anthropogenic

#### ( ) Sunspots cause warming – new isotope records prove

Watts ‘11

(Anthony, Meteorologist and president of IntelliWeather Inc., citing “A new approach to the long-term reconstruction of the solar irradiance leads to large historical solar forcing,” a study conducted by the World Radiation Center in Switzerland, “New solar reconstruction paper suggests 6x greater solar forcing change than cited by the IPCC,” 5/10, <http://wattsupwiththat.com/2011/05/10/new-solar-reconstruction-paper-suggests-6x-tsi-change-than-cited-by-the-ipcc/>)

This is interesting. This recent paper published in the journal Astronomy & Astrophysics here has done a reconstruction of TSI using Beryllium 10 isotope records combined with sunspot records. The paper suggests that the Total Solar Irradiance (TSI) has increased since the end of the Little Ice Age (around 1850) by up to 6 x more than cited by the IPCC. Here is how they did it:

For the reconstruction to the past this amplitude is scaled with proxies for solar activity. Two proxies are available for the reconstruction: Group sunspot number, which is available from the present to 1610 AD, and the solar modulation potential extending back to circa 7300 BC. The latter is a measure of the heliospheric shielding from cosmic rays derived from the analysis of cosmogenic isotope abundances in tree rings or ice cores, and is available with a time resolution of 2-3 solar cycles (Steinhilber et al. 2008). Although sunspot number dropped to zero for a long time during the Maunder minimum, the solar cycle was uninterrupted (Beer et al. 1998; Usoskin et al. 2001) and the modulation potential did not fall to zero. Hence, a reconstruction based solely on sunspot number may underestimate the solar activity during theMaunderminimum. Therefore in our reconstruction we used the solar modulation potential to calculate the long-term variations and sunspot number to superpose them with the 11-year cycle variations (see the Online Section 6.2). The modulation potential used in the calculations is based on the composite of data determined from the cosmogenic isotope records of 10Be and neutronmonitor. 10Be data are available up to about 1970 (McCracken et al. 2004) and neutron monitor data, which are used to calculate the current solar modulation potential, are available since the 1950s.

#### ( ) Prefer our methodology – cites ice cores and monitoring

Shapiro et al. ‘11

(A. I. Shapiro, W. Schmutz, E. Rozanov, M. Schoell, M. Haberreiter, A. V. Shapiro and S. Nyeki, researchers for the World Radiation Center, Switzerland and Institute for Atmospheric and Climate science ETH, Switzerland, “A new approach to the long-term reconstruction of the solar irradiance leads to large historical solar forcing,” 2/22, <http://wattsupwiththat.com/2011/05/10/new-solar-reconstruction-paper-suggests-6x-tsi-change-than-cited-by-the-ipcc/>)

The variable Sun is the most likely candidate for the natural forcing of past climate changes on time scales of 50 to 1000 years. Evidence for this understanding is that the terrestrial climate correlates positively with the solar activity. During the past 10 000 years, the Sun has experienced the substantial variations in activity and there have been numerous attempts to reconstruct solar irradiance. While there is general agreement on how solar forcing varied during the last several hundred years – all reconstructions are proportional to the solar activity – there is scientific controversy on the magnitude of solar forcing. Aims. We present a reconstruction of the total and spectral solar irradiance covering 130 nm–10 μm from 1610 to the present with an annual resolution and for the Holocene with a 22-year resolution. Methods. We assume that the minimum state of the quiet Sun in time corresponds to the observed quietest area on the present Sun. Then we use available long-term proxies of the solar activity, which are 10Be isotope concentrations in ice cores and 22-year smoothed neutron monitor data, to interpolate between the present quiet Sun and the minimum state of the quiet Sun. This determines the long-term trend in the solar variability, which is then superposed with the 11-year activity cycle calculated from the sunspot number. The time-dependent solar spectral irradiance from about 7000 BC to the present is then derived using a state-of-the-art radiation code.

Conclusions

We present a new technique to reconstruct total and spectral solar irradiance over the Holocene. We obtained a large historical solar forcing between the Maunder minimum and the present, as well as a significant increase in solar irradiance in the first half of the twentieth-century. Our value of the historical solar forcing is remarkably larger than other estimations published in the recent literature.

### Extensions – Feedbacks are Negative

#### ( ) Positive feedback models wrong, their impacts exaggerated

Happer ‘12

(William is a professor of physics at Princeton. “Global Warming Models Are Wrong Again”, Wall Street Journal, 3/27/12, <http://online.wsj.com/article/SB10001424052702304636404577291352882984274.html>)

The direct warming due to doubling CO2 levels in the atmosphere can be calculated to cause a warming of about one degree Celsius. The IPCC computer models predict a much larger warming, three degrees Celsius or even more, because they assume changes in water vapor or clouds that supposedly amplify the direct warming from CO2. Many lines of observational evidence suggest that this "positive feedback" also has been greatly exaggerated. There has indeed been some warming, perhaps about 0.8 degrees Celsius, since the end of the so-called Little Ice Age in the early 1800s. Some of that warming has probably come from increased amounts of CO2, but the timing of the warming—much of it before CO2 levels had increased appreciably—suggests that a substantial fraction of the warming is from natural causes that have nothing to do with mankind.

#### ( ) Empirics proves feedbacks are negative

Worstall ‘12

(Tim, writer for Forbes, “If the MWP Was Global What Does That Tell Us About Climate Change Now?” <http://www.forbes.com/sites/timworstall/2012/03/23/if-the-mwp-was-global-what-does-that-tell-us-about-climate-change-now/>)

That the Earth has temperature cycles isn’t a surprise, we all know there were Ice Ages. So that we had a time when temperatures were higher than now and everything was just dandy doesn’t mean that it will all remain dandy if we carry on in our current manner. However, the great unknown of climate change science is “climate sensitivity”. This is how much temperature will rise given a doubling of atmospheric CO2 (technically, CO2-equivalent, converting all the methane etc to one handy unit). We know how much will come directly: 0.7 of a degree. That isn’t something to worry overmuch about. The question then becomes, well, what happens then: when the ice melts and albedo lowers, when warmer weather and higher CO2 increase plant growth, what happens to clouds and so on through a list of hundreds of possible feedbacks. We don’t even know if some of these will be positive or negative, will further increase temperatures or reduce them and we certainly don’t know what the cumulative effect will be. Currently the best guesses are in the 2 to 4.5 degree range but these are indeed guesses. Well informed guesses, being done with a variety of methods by very good scientists trying to get at the truth but they are guesses. And the most important information underlying them is, well, what happened previous times the Earth got warmer? Did it carry on doing so? Or did it get so far and stop or even retreat? Which is where the MWP comes in. If it was a truly global phenomenon then we’ve more evidence (only more evidence, nothing conclusive at all) that rises in temperature similar to what we’re seeing don’t, always, carry on. Sometimes at least they stop of their own accord: could be solar action, could be feedbacks. From which the takeaway point is that perhaps climate sensitivity is lower than currently thought and thus climate change is less dangerous than currently thought.

\*Note: MWP = Medieval Warming Period

#### ( ) Err neg – if feedbacks are somewhere in the middle adaptation solves

Ridley ‘12

(Matt, writer for Wired Magazine, “Apocalypse Not: Here’s Why You Shouldn’t Worry About End Times,” 8/17, <http://www.wired.com/wiredscience/2012/08/ff_apocalypsenot/all>)

So, should we worry or not about the warming climate? It is far too binary a question. The lesson of failed past predictions of ecological apocalypse is not that nothing was happening but that the middle-ground possibilities were too frequently excluded from consideration. In the climate debate, we hear a lot from those who think disaster is inexorable if not inevitable, and a lot from those who think it is all a hoax. We hardly ever allow the moderate “lukewarmers” a voice: those who suspect that the net positive feedbacks from water vapor in the atmosphere are low, so that we face only 1 to 2 degrees Celsius of warming this century; that the Greenland ice sheet may melt but no faster than its current rate of less than 1 percent per century; that net increases in rainfall (and carbon dioxide concentration) may improve agricultural productivity; that ecosystems have survived sudden temperature lurches before; and that adaptation to gradual change may be both cheaper and less ecologically damaging than a rapid and brutal decision to give up fossil fuels cold turkey. We’ve already seen some evidence that humans can forestall warming-related catastrophes. A good example is malaria, which was once widely predicted to get worse as a result of climate change. Yet in the 20th century, malaria retreated from large parts of the world, including North America and Russia, even as the world warmed. Malaria-specific mortality plummeted in the first decade of the current century by an astonishing 25 percent. The weather may well have grown more hospitable to mosquitoes during that time. But any effects of warming were more than counteracted by pesticides, new antimalarial drugs, better drainage, and economic development. Experts such as Peter Gething at Oxford argue that these trends will continue, whatever the weather. Just as policy can make the climate crisis worse—mandating biofuels has not only encouraged rain forest destruction, releasing carbon, but driven millions into poverty and hunger—technology can make it better. If plant breeders boost rice yields, then people may get richer and afford better protection against extreme weather. If nuclear engineers make fusion (or thorium fission) cost-effective, then carbon emissions may suddenly fall. If gas replaces coal because of horizontal drilling, then carbon emissions may rise more slowly. Humanity is a fast-moving target. We will combat our ecological threats in the future by innovating to meet them as they arise, not through the mass fear stoked by worst-case scenarios.

### Extensions – Models Fail

#### ( ) Observational evidence disproves climate models

Evans ‘12

(David has a PhD in electrical engineering, worked from 1999 to 2006 for the Australian Greenhouse Office, an agency of the Australian government, designing a carbon accounting system, Financial Post, "Global Warming Theory Is Based on False Science.",7 Apr. 2011)

The planet reacts to that extra carbon dioxide, which changes everything. Most critically, the extra warmth causes more water to evaporate from the oceans. But does the water hang around and increase the height of moist air in the atmosphere, or does it simply create more clouds and rain? Back in 1980, when the carbon dioxide theory started, no one knew. The alarmists guessed that it would increase the height of moist air around the planet, which would warm the planet even further, because the moist air is also a greenhouse gas. This is the core idea of every official climate model: For each bit of warming due to carbon dioxide, they claim it ends up causing three bits of warming due to the extra moist air. The climate models amplify the carbon dioxide warming by a factor of three—so two-thirds of their projected warming is due to extra moist air (and other factors); only one-third is due to extra carbon dioxide. That's the core of the issue. All the disagreements and misunderstandings spring from this. The alarmist case is based on this guess about moisture in the atmosphere, and there is simply no evidence for the amplification that is at the core of their alarmism. Weather balloons had been measuring the atmosphere since the 1960s, many thousands of them every year. The climate models all predict that as the planet warms, a hot spot of moist air will develop over the tropics about 10 kilometres up, as the layer of moist air expands upwards into the cool dry air above. During the warming of the late 1970s, '80s and '90s, the weather balloons found no hot spot. None at all. Not even a small one. This evidence proves that the climate models are fundamentally flawed, that they greatly overestimate the temperature increases due to carbon dioxide. This evidence first became clear around the mid-1990s.

#### ( ) Models aren’t detailed enough – prefer observational evidence

Spencer ‘8

(Roy W. Ph.D., climatologist, author, former NASA scientist, “Satellite and Climate Model Evidence Against Substantial Manmade Climate Change (supercedes “Has the Climate Sensitivity Holy Grail Been Found?”)”, Roy W. Spencer, 12/27/08, [http://www.drroyspencer.com/research-articles/satellite-and-climate-model-evidence/](http://www.theregister.co.uk/2011/06/14/ice_age/))

What I have presented here is, as far as I know, the most detailed attempt to reconcile satellite observations of the climate system with the behavior of climate models in the context of feedbacks. Instead of the currently popular practice of building immensely complex and expensive climate models and then making only simple comparisons to satellite data, I have done just the opposite: Examine the satellite data in great detail, and then build the simplest model that can explain the observed behavior of the climate system. The resulting picture that emerges is of an IN-sensitive climate system, dominated by negative feedback. And it appears that the reason why most climate models are instead VERY sensitive is due to the illusion of a sensitive climate system that can arise when one is not careful about the physical interpretation of how clouds operate in terms of cause and effect (forcing and feedback). Indeed, climate researchers seldom (if ever) dig into the archives of satellite data and ask the question, “What are the satellite data telling us about the real climate system?” Instead, most climate research money now is funneled into building expensive climate models which are then expected to provide a basis for formulating public policy. Given the immense effort that has been invested, one would think that those models would be more rigorously tested. There is nothing inherently wrong with a model-centric approach to climate research…as long as the modeler continues to use the observations to guide the model development over time. Unfortunately, as Richard Lindzen at MIT has pointed out, the fact that modelers use the term “model validation” rather than “model testing” belies their inherent preference of theory over observations. The allure of models is strong: they are clean, with well-defined equations and mathematical precision. Observations of the real climate system are dirty, incomplete, and prone to measurement error. The comparisons modelers make between their models and satellite data are typically rather crude and cursory. They are not sufficiently detailed to really say anything of substance about feedbacks — in either the models or the satellite data – and yet it is the feedbacks that will determine how serious the manmade global warming problem will be.

## New Aff Materials

### Yes Consensus

#### There’s an unquestionable scientific consensus about warming.

Nuccitelli 16 — Dana Nuccitelli, Climate Writer for the *Guardian*, Environmental Scientist at Tetra Tech—a private environmental consulting firm, holds an M.A. in Physics from the University of California-Davis and a B.A. in Astrophysics from the University of California-Berkeley, 2016 (“It’s settled: 90–100% of climate experts agree on human-caused global warming,” *Climate Consensus – The 97%*—a *Guardian* blog about climate change, April 13th, Available Online at <https://www.theguardian.com/environment/climate-consensus-97-per-cent/2016/apr/13/its-settled-90100-of-climate-experts-agree-on-human-caused-global-warming>, Accessed 07-15-2016)

There is an overwhelming expert scientific consensus on human-caused global warming.

Authors of seven previous climate consensus studies — including Naomi Oreskes, Peter Doran, William Anderegg, Bart Verheggen, Ed Maibach, J. Stuart Carlton, John Cook, myself, and six of our colleagues — have co-authored a new paper that should settle this question once and for all. The two key conclusions from the paper are:

1) Depending on exactly how you measure the expert consensus, it’s somewhere between 90% and 100% that agree humans are responsible for climate change, with most of our studies finding 97% consensus among publishing climate scientists.

2) The greater the climate expertise among those surveyed, the higher the consensus on human-caused global warming.

[Graphic Omitted]

Expert consensus is a powerful thing. People know we don’t have the time or capacity to learn about everything, and so we frequently defer to the conclusions of experts. It’s why we visit doctors when we’re ill. The same is true of climate change: most people defer to the expert consensus of climate scientists. Crucially, as we note in our paper:

Public perception of the scientific consensus has been found to be a gateway belief, affecting other climate beliefs and attitudes including policy support.

That’s why those who oppose taking action to curb climate change have engaged in a misinformation campaign to deny the existence of the expert consensus. They’ve been largely successful, as the public badly underestimate the expert consensus, in what we call the “consensus gap.” Only 12% of Americans realize that the consensus is above 90%.

[Video Omitted]

Consensus misrepresentations

Our latest paper was written in response to a critique published by Richard Tol in Environmental Research Letters, commenting on the 2013 paper published in the same journal by John Cook, myself, and colleagues finding a 97% consensus on human-caused global warming in the peer-reviewed literature.

Tol argues that when considering results from previous consensus studies, the Cook 97% figure is an outlier, which he claims is much higher than most other climate consensus estimates. He makes this argument by looking at sub-samples from previous surveys. For example, Doran’s 2009 study broke down the survey data by profession – the consensus was 47% among economic geologists, 64% among meteorologists, 82% among all Earth scientists, and 97% among publishing climate scientists. The lower the climate expertise in each group, the lower the consensus.

[Graph Omitted]

Like several of these consensus surveys, Doran cast a wide net and included responses from many non-experts, but among the experts, the consensus is consistently between 90% and 100%. However, by including the non-expert samples, it’s possible to find low “consensus” values.

The flaw in this approach is especially clear when we consider the most ridiculous sub-sample included in Tol’s critique: Verheggen’s 2015 study included a grouping of predominantly non-experts who were “unconvinced” by human-caused global warming, among whom the consensus was 7%. The only surprising thing about this number is that more than zero of those “unconvinced” by human-caused global warming agree that humans are the main cause of global warming. In his paper, Tol included this 7% “unconvinced,” non-expert sub-sample as a data point in his argument that the 97% consensus result is unusually high.

By breaking out all of these sub-samples of non-experts, the critique thus misrepresented a number of previous consensus studies in an effort to paint our 97% result as an outlier. The authors of those misrepresented studies were not impressed with this approach, denouncing the misrepresentations of their work in no uncertain terms.

We subsequently collaborated with those authors in this newly-published scholarly response, bringing together an all-star lineup of climate consensus experts. The following quote from the paper sums up our feelings about the critique’s treatment of our research:

Tol’s (2016) conflation of unrepresentative non-expert sub-samples and samples of climate experts is a misrepresentation of the results of previous studies, including those published by a number of coauthors of this paper.

Consensus on consensus

In our paper, we show that including non-experts is the only way to argue for a consensus below 90–100%. The greater the climate expertise among those included in the survey sample, the higher the consensus on human-caused global warming. Similarly, if you want to know if you need open heart surgery, you’ll get much more consistent answers (higher consensus) if you only ask cardiologists than if you also survey podiatrists, neurologists, and dentists.

That’s because, as we all know, expertise matters. It’s easy to manufacture a smaller non-expert “consensus” number and argue that it contradicts the 97% figure. As our new paper shows, when you ask the climate experts, the consensus on human-caused global warming is between 90% and 100%, with several studies finding 97% consensus among publishing climate scientists.

There’s some variation in the percentage, depending on exactly how the survey is done and how the question is worded, but ultimately it’s still true that there’s a 97% consensus in the peer-reviewed scientific literature on human-caused global warming. In fact, even Richard Tol has agreed:

The consensus is of course in the high nineties.

Is the consensus 97% or 99.9%?

In fact, some believe our 97% consensus estimate was too low. These claims are usually based on an analysis done by James Powell, and the difference simply boils down to how “consensus” is defined. Powell evaluated the percentage of papers that don’t explicitly reject human-caused global warming in their abstracts. That includes 99.83% of papers published between 1991 and 2012, and 99.96% of papers published in 2013.

In short, 97% of peer-reviewed climate research that states a position on human-caused warming endorses the consensus, and about 99.9% of the total climate research doesn’t explicitly reject human-caused global warming. Our two analyses simply answer different questions. The percentage of experts and their research that endorse the theory is a better description of “consensus.” However, Powell’s analysis is useful in showing how few peer-reviewed scientific papers explicitly reject human-caused global warming.

In any case, there’s really no question that humans are the driving force causing global warming. The experts are almost universally convinced because the scientific evidence is overwhelming. Denying the consensus by misrepresenting the research won’t change that reality.

With all of the consensus authors teaming up to show the 90–100% expert consensus on human-caused global warming, and most finding 97% consensus among publishing climate scientists, this paper should be the final word on the subject.

#### Prefer our evidence — it’s a meta-study of meta-studies.

MTU 16 — Michigan Technological University, 2016 (“Consensus on consensus: Expertise matters in agreement over human-caused climate change,” *Science Daily*, April 12th, Available Online at <https://www.sciencedaily.com/releases/2016/04/160412211610.htm>, Accessed 07-15-2016)

A research team confirms that 97 percent of climate scientists agree that climate change is caused by humans. The group includes Sarah Green, a chemistry professor at Michigan Technological University.

"What's important is that this is not just one study -- it's the consensus of multiple studies," Green says. This consistency across studies contrasts with the language used by climate change doubters. This perspective stems from, as the authors write, "conflating the opinions of non-experts with experts and assuming that lack of affirmation equals dissent."

Environmental Research Letters published the paper this week. In it, the team lays out what they call "consensus on consensus" and draws from seven independent consensus studies by the co-authors. This includes a study from 2013, in which the researchers surveyed more than 11,000 abstracts and found most scientists agree that humans are causing climate change. Through this new collaboration, multiple consensus researchers – and their data gathered from different approaches – lead to essentially the same conclusion.

The key factor comes down to expertise: The more expertise in climate science the scientists have, the more they agree on human-caused climate change.

Skeptic vs. Doubter

There are many surveys about climate change consensus. The problem with some surveys, Green points out, is that they are biased towards populations with predetermined points of view. Additionally, respondents to some surveys lack scientific expertise in climate science.

"The public has a very skewed view of how much disagreement there is in the scientific community," she says. Only 12 percent of the US public are aware there is such strong scientific agreement in this area, and those who reject mainstream climate science continue to claim that there is a lack of scientific consensus. People who think scientists are still debating climate change do not see the problem as urgent and are unlikely to support solutions.

This new paper is a rebuttal to a comment criticizing the 2013 paper. Green is quick to point out that skepticism, a drive to dig deeper and seeking to better validate data, is a crucial part of the scientific process.

"But climate change denial is not about scientific skepticism," she says.

Broader Impacts

Refuting climate change doubters is the main purpose of a website Green contributes to called skepticalscience.com. The website is run by the new study's lead author, John Cook from the University of Queensland in Australia. He says consensus studies have helped change political dialogue around climate change.

"The progress made at the United Nations Climate Change Conference (COP21) in Paris late last year indicates that countries are now well and truly behind the scientific consensus, too," Cook says.

Co-author Naomi Oreskes from Harvard University originally pursued consensus data about climate change in 2004 and co-wrote Merchants of Doubt, which was turned into a documentary in 2014. She says that this latest work places the findings in the broader context of other research.

"By compiling and analyzing all of this research – essentially a meta-study of meta-studies – we've established a consistent picture with high levels of scientific agreement among climate experts," she says.

And among climate scientists, there's little doubt. There is consensus on consensus.

#### Dismiss evidence from skeptics — it’s single-study syndrome.

Nuccitelli 14 — Dana Nuccitelli, Climate Writer for the *Guardian*, Environmental Scientist at Tetra Tech—a private environmental consulting firm, holds an M.A. in Physics from the University of California-Davis and a B.A. in Astrophysics from the University of California-Berkeley, 2014 (“The 97% v the 3% – just how much global warming are humans causing?,” *Climate Consensus – The 97%*—a *Guardian* blog about climate change, September 15th, Available Online at http://www.theguardian.com/environment/climate-consensus-97-per-cent/2014/sep/15/97-vs-3-how-much-global-warming-are-humans-causing, Accessed 09-26-2014)

A pair of climate scientists recently had a dispute regarding how much global warming humans are responsible for. Gavin Schmidt from NASA represented the consensus of 96–97% of climate experts in arguing that humans have been the dominant cause of global warming since 1950, while Judith Curry from Georgia Tech represented the opinions of 2–4% of climate experts that we could be responsible for less than half of that warming.

Curry is to be the featured speaker on this subject at a National Press Club event tomorrow hosted by the Marshall Institute; a right-wing thinktank that has spread misinformation about the dangers of smoking, ozone depletion, acid rain, DDT, and now climate change. She may also discuss the subject at an event next week hosted by the fossil fuel-funded right-wing think tank Texas Public Policy Foundation (TPPF).

The exchange between Schmidt and Curry can be read on RealClimate – a blog run by climate scientists. The discrepancy in both the quantity and quality of the supporting evidence used by each scientist was one of the most telling aspects of their debate.

For his part, Schmidt referenced the most recent IPCC report. The IPCC summarises the latest and greatest climate science research, so there is no better single source. The figure below from the IPCC report illustrates why 96–97% of climate science experts and peer-reviewed research agree that humans are the main cause of global warming.

[graphic omitted]

The black bar indicates the amount of global surface warming observed from 1951 to 2010. The green bar shows the amount of warming caused by human greenhouse gas emissions during that time. The yellow is the influence from other human effects (mainly cooling from human sulfate aerosol emissions, which scatter sunlight), and the orange is the combined human effect. Below those are the contributions from external natural factors (mainly the sun and volcanoes) and from natural internal variability (mainly ocean cycles), while the whiskers show the uncertainty range for each.

[graphic omitted — IPCC AR5 Figure 10.5: Assessed likely ranges (whiskers) and their mid-points (bars) for attributable warming trends over the 1951–2010 period due to well-mixed greenhouse gases, other anthropogenic forcings (OA), natural forcings (NAT), combined anthropogenic forcings (ANT) and internal variability. The HadCRUT4 observations are shown in black with the 5 to 95% uncertainty range due to observational uncertainty in this record.

IPCC AR5 figure 10.5: Likely ranges (whiskers) and their mid-points (bars) for attributable warming trends over the 1951–2010 period due to greenhouse gases, other anthropogenic forcings (OA), natural forcings (NAT), combined anthropogenic forcings (ANT) and internal variability. The HadCRUT4 observations are shown in black.]

Notice that the green and orange bars are both bigger than the black bar. This shows that greenhouse gases have caused more warming than has been observed over the past six decades, but some of that was offset by cooling from human aerosol pollution. And the best estimate from the body of peer-reviewed climate science research is that humans are responsible for more than 100% of the global surface warming since 1950, with natural factors probably offsetting a little bit of that with a slight cooling influence.

Schmidt illustrated this key point in the figure below, which is called a probability distribution of the warming caused by humans since 1950. The curve is centered at about 110% – the most likely value for the human contribution to global warming, while the probability of the human contribution being less than 50% is almost nil.

[graphic omitted — The probability density function for the fraction of warming attributable to human activity (derived from Fig. 10.5 in IPCC AR5). The bulk of the probability is far to the right of the “50%” line, and the peak is around 110%.

The probability density function for the fraction of warming attributable to human activity (derived from figure 10.5 in IPCC AR5). The bulk of the probability is far to the right of the ‘50%’ line, and the peak is around 110%. Source: RealClimate]

Again it’s important to remember that the IPCC report is just a summary of the latest and greatest climate science research. The figures above are supported by the papers that have specifically investigated the attribution of recent global warming. This isn’t just one study; it’s based on many studies that are all in strong agreement. As the IPCC report concluded,

It is extremely likely that human activities caused more than half of the observed increase in GMST [global mean surface temperature] from 1951 to 2010.This assessment is supported by robust evidence from multiple studies using different methods.

It’s not just “more than half,” it’s also most likely close to 100%. In fact it’s just as likely that humans are responsible for about 160% of the global surface warming since 1950 as it is that we’re only responsible for 50%.

Curry disagrees with the expert consensus on this issue, but her arguments are rather muddled and “confused,” as Schmidt puts it. Her main argument is that there is uncertainty regarding the contribution of internal variability. The problem with that argument is that over long periods of time (like the six decades since 1950), positive and negative phases of ocean cycles tend to cancel each other out, and thus internal variability doesn’t have a large influence on long-term temperatures. As the first figure above shows, the IPCC estimates the temperature influence of internal variability since 1950 at ±0.1°C, during which time we’ve seen about 0.65°C global surface warming.

Curry also references a report written by Nic Lewis for the anti-climate policy think tank Global Warming Policy Foundation (GWPF), which I wrote about here. The GWPF report argues that the climate sensitivity is toward the lower end of the IPCC estimated range. However, the report is biased towards Lewis’ preferred approach, finding poor excuses to reject the many other methods that arrive at higher climate sensitivity estimates. Moreover, recent research has identified flaws in Lewis’ approach that explain why it incorrectly yields the lowest climate sensitivity estimates. In any case, even if the GWPF were correct, it wouldn’t disprove that most of the warming since 1950 is human-caused.

Curry’s other reference is to a single paper written by Zhou & Tung at the University of Washington in 2013, which concluded that roughly half of the global surface warming over the past 32 or 50 years could be explained by ocean cycles (specifically, the Atlantic Multi-decadal Oscillation). Matt Ridley also recently referenced this paper in an error-riddled Wall Street Journal editorial (debunked here and here and here and here). However, as Schmidt points out,

Tung and Zhou assumed that all multi-decadal variability was associated with the Atlantic Multi-decadal Oscillation (AMO) and did not assess whether anthropogenic forcings could project onto this variability. It is circular reasoning to then use this paper to conclude that all multi-decadal variability is associated with the AMO.

Recent research led by Michael Mann has confirmed that the approach used by Tung and Zhou misidentifies external influences on the AMO as being part of its internal variability.

The problem with relying on a single paper (aka “single study syndrome”) is that flawed studies sometimes get published. On the other hand, when many studies using multiple independent approaches arrive at similar results, they’re probably right. Schmidt’s supporting evidence is far stronger than Curry’s.

Thus although Curry doesn’t understand why so few experts agree with her, it’s easy to see why 96–97% of climate scientists and their peer-reviewed research agree that humans are the main cause of global warming. That’s what the scientific evidence overwhelmingly shows. While it’s possible to find one or two flawed papers arguing to the contrary, the balance of evidence is tilted heavily to the side of human-caused global warming.

It’s about as settled as science gets. In fact, it’s about as settled as the fact that smoking causes cancer, chlorofluorocarbons cause ozone depletion, sulfur dioxide causes acid rain, and DDT is toxic. Although the science is inconvenient for certain industries and the political think tanks they fund (like the Marshall Institute and TPPF), these effects all pose dangers to public health. Climate change perhaps most of all.

## New Neg Materials

### Impact Defense

#### No impact for a century — IPCC agrees.

Ridley 15 — Matt Ridley, Fellow of the Royal Society of Literature and of the Academy of Medical Sciences, Foreign Honorary Member of the American Academy of Arts and Sciences, Conservative Member of the House of Lords (UK), Author of several popular science books including *The Rational Optimist: How Prosperity Evolves* and *The Evolution of Everything: How Ideas Emerge*, former Science Editor at *The Economist*, former Visiting Professor at Cold Spring Harbor Laboratory in New York, holds a D.Phil. in Zoology from Magdalen College, Oxford, 2015 (“Climate Change Will Not Be Dangerous for a Long Time,” *Scientific American*, November 27th, Available Online at http://www.scientificamerican.com/article/climate-change-will-not-be-dangerous-for-a-long-time/, Accessed 07-17-2016)

The climate change debate has been polarized into a simple dichotomy. Either global warming is “real, man-made and dangerous,” as Pres. Barack Obama thinks, or it’s a “hoax,” as Oklahoma Sen. James Inhofe thinks. But there is a third possibility: that it is real, man-made and not dangerous, at least not for a long time.

This “lukewarm” option has been boosted by recent climate research, and if it is right, current policies may do more harm than good. For example, the Food and Agriculture Organization of the United Nations and other bodies agree that the rush to grow biofuels, justified as a decarbonization measure, has raised food prices and contributed to rainforest destruction. Since 2013 aid agencies such as the U.S. Overseas Private Investment Corporation, the World Bank and the European Investment Bank have restricted funding for building fossil-fuel plants in Asia and Africa; that has slowed progress in bringing electricity to the one billion people who live without it and the four million who die each year from the effects of cooking over wood fires.

In 1990 the Intergovernmental Panel on Climate Change (IPCC) was predicting that if emissions rose in a “business as usual” way, which they have done, then global average temperature would rise at the rate of about 0.3 degree Celsius per decade (with an uncertainty range of 0.2 to 0.5 degree C per decade). In the 25 years since, temperature has risen at about 0.1 to 0.2 degree C per decade, depending on whether surface or satellite data is used. The IPCC, in its most recent assessment report, lowered its near-term forecast for the global mean surface temperature over the period 2016 to 2035 to just 0.3 to 0.7 degree C above the 1986–2005 level. That is a warming of 0.1 to 0.2 degree C per decade, in all scenarios, including the high-emissions ones.

At the same time, new studies of climate sensitivity—the amount of warming expected for a doubling of carbon dioxide levels from 0.03 to 0.06 percent in the atmosphere—have suggested that most models are too sensitive. The average sensitivity of the 108 model runs considered by the IPCC is 3.2 degrees C. As Pat Michaels, a climatologist and self-described global warming skeptic at the Cato Institute testified to Congress in July, certain studies of sensitivity published since 2011 find an average sensitivity of 2 degrees C.

Such lower sensitivity does not contradict greenhouse-effect physics. The theory of dangerous climate change is based not just on carbon dioxide warming but on positive and negative feedback effects from water vapor and phenomena such as clouds and airborne aerosols from coal burning. Doubling carbon dioxide levels, alone, should produce just over 1 degree C of warming. These feedback effects have been poorly estimated, and almost certainly overestimated, in the models.

The last IPCC report also included a table debunking many worries about “tipping points” to abrupt climate change. For example, it says a sudden methane release from the ocean, or a slowdown of the Gulf Stream, are “very unlikely” and that a collapse of the West Antarctic or Greenland ice sheets during this century is “exceptionally unlikely.”

If sensitivity is low and climate change continues at the same rate as it has over the past 50 years, then dangerous warming—usually defined as starting at 2 degrees C above preindustrial levels—is about a century away. So we do not need to rush into subsidizing inefficient and land-hungry technologies, such as wind and solar or risk depriving poor people access to the beneficial effects of cheap electricity via fossil fuels.

#### Climate change is not catastrophic — their impacts exaggerate.

Tol 14 — Richard Tol, Professor of Economics at the University of Sussex, Professor of the Economics of Climate Change at the Vrije Universiteit Amsterdam, Member of the Academia Europaea—a European non-governmental scientific association, served as Coordinating Lead Author for the IPCC *Fifth Assessment Report Working Group II: Impacts, Adaptation and Vulnerability*, holds a Ph.D. in Economics and an M.Sc. in Econometrics and Operations Research from the VU University Amsterdam, 2014 (“Bogus prophecies of doom will not fix the climate,” *Financial Times*, March 31st, Available Online at <https://next.ft.com/content/e8d011fa-b8b5-11e3-835e-00144feabdc0>, Accessed 07-15-2016)

Humans are a tough and adaptable species. People live on the equator and in the Arctic, in the desert and in the rainforest. We survived the ice ages with primitive technologies. The idea that climate change poses an existential threat to humankind is laughable.

Climate change will have consequences, of course. Since different plants and animals thrive in different climates, it will affect natural ecosystems and agriculture. Warmer and wetter weather will advance the spread of tropical diseases. Seas will rise, putting pressure on all that lives on the coast. These impacts sound alarming but they need to be put in perspective before we draw conclusions about policy.

According to Monday’s report by the Intergovernmental Panel on Climate Change, a further warming of 2C could cause losses equivalent to 0.2-2 per cent of world gross domestic product. On current trends, that level of warming would happen some time in the second half of the 21st century. In other words, half a century of climate change is about as bad as losing one year of economic growth.

Since the start of the crisis in the eurozone, the income of the average Greek has fallen more than 20 per cent. Climate change is not, then, the biggest problem facing humankind. It is not even its biggest environmental problem. The World Health Organisation estimates that about 7m [million] people are now dying each year as a result of air pollution. Even on the most pessimistic estimates, climate change is not expected to cause loss of life on that scale for another 100 years.

#### No catastrophic impact — they overestimate the predictive power of models.

Ridley 15 — Matt Ridley, Fellow of the Royal Society of Literature and of the Academy of Medical Sciences, Foreign Honorary Member of the American Academy of Arts and Sciences, Conservative Member of the House of Lords (UK), Author of several popular science books including *The Rational Optimist: How Prosperity Evolves* and *The Evolution of Everything: How Ideas Emerge*, former Science Editor at *The Economist*, former Visiting Professor at Cold Spring Harbor Laboratory in New York, holds a D.Phil. in Zoology from Magdalen College, Oxford, 2015 (“My Life As A Climate Lukewarmer,” *Times* (UK), January 19th, Available Online at <http://www.rationaloptimist.com/blog/my-life-as-a-climate-lukewarmer.aspx>, Accessed 07-16-2016)

I was not always a lukewarmer. When I first started writing about the threat of global warming more than 26 years ago, as science editor of The Economist, I thought it was a genuinely dangerous threat. Like, for instance, Margaret Thatcher, I accepted the predictions being made at the time that we would see warming of a third or a half a degree (Centigrade) a decade, perhaps more, and that this would have devastating consequences.

Gradually, however, I changed my mind. The failure of the atmosphere to warm anywhere near as rapidly as predicted was a big reason: there has been less than half a degree of global warming in four decades — and it has slowed down, not speeded up. Increases in malaria, refugees, heatwaves, storms, droughts and floods have not materialised to anything like the predicted extent, if at all. Sea level has risen but at a very slow rate — about a foot per century.

Also, I soon realised that all the mathematical models predicting rapid warming assume big amplifying feedbacks in the atmosphere, mainly from water vapour; carbon dioxide is merely the primer, responsible for about a third of the predicted warming. When this penny dropped, so did my confidence in predictions of future alarm: the amplifiers are highly uncertain.

Another thing that gave me pause was that I went back and looked at the history of past predictions of ecological apocalypse from my youth – population explosion, oil exhaustion, elephant extinction, rainforest loss, acid rain, the ozone layer, desertification, nuclear winter, the running out of resources, pandemics, falling sperm counts, cancerous pesticide pollution and so forth. There was a consistent pattern of exaggeration, followed by damp squibs: in not a single case was the problem as bad as had been widely predicted by leading scientists. That does not make every new prediction of apocalypse necessarily wrong, of course, but it should encourage scepticism.

What sealed my apostasy from climate alarm was the extraordinary history of the famous “hockey stick” graph, which purported to show that today’s temperatures were higher and changing faster than at any time in the past thousand years. That graph genuinely shocked me when I first saw it and, briefly in the early 2000s, it persuaded me to abandon my growing doubts about dangerous climate change and return to the “alarmed” camp.

Then I began to read the work of two Canadian researchers, Steve McIntyre and Ross McKitrick. They and others have shown, as confirmed by the National Academy of Sciences in the United States, that the hockey stick graph, and others like it, are heavily reliant on dubious sets of tree rings and use inappropriate statistical filters that exaggerate any 20th-century upturns.

What shocked me more was the scientific establishment’s reaction to this: it tried to pretend that nothing was wrong. And then a flood of emails was leaked in 2009 showing some climate scientists apparently scheming to withhold data, prevent papers being published, get journal editors sacked and evade freedom-of-information requests, much as sceptics had been alleging. That was when I began to re-examine everything I had been told about climate change and, the more I looked, the flakier the prediction of rapid warming seemed.

I am especially unimpressed by the claim that a prediction of rapid and dangerous warming is “settled science”, as firm as evolution or gravity. How could it be? It is a prediction! No prediction, let alone in a multi-causal, chaotic and poorly understood system like the global climate, should ever be treated as gospel. With the exception of eclipses, there is virtually nothing scientists can say with certainty about the future. It is absurd to argue that one cannot disagree with a forecast. Is the Bank of England’s inflation forecast infallible?

#### Our impact defense is consistent with the scientific consensus.

Ridley 15 — Matt Ridley, Fellow of the Royal Society of Literature and of the Academy of Medical Sciences, Foreign Honorary Member of the American Academy of Arts and Sciences, Conservative Member of the House of Lords (UK), Author of several popular science books including *The Rational Optimist: How Prosperity Evolves* and *The Evolution of Everything: How Ideas Emerge*, former Science Editor at *The Economist*, former Visiting Professor at Cold Spring Harbor Laboratory in New York, holds a D.Phil. in Zoology from Magdalen College, Oxford, 2015 (“My Life As A Climate Lukewarmer,” *Times* (UK), January 19th, Available Online at <http://www.rationaloptimist.com/blog/my-life-as-a-climate-lukewarmer.aspx>, Accessed 07-16-2016)

Incidentally, my current view is still consistent with the “consensus” among scientists, as represented by the reports of the Intergovernmental Panel on Climate Change. The consensus is that climate change is happening, not that it is going to be dangerous. The latest IPCC report gives a range of estimates of future warming, from harmless to terrifying. My best guess would be about one degree of warming during this century, which is well within the IPCC’s range of possible outcomes.

Yet most politicians go straight to the top of the IPCC’s range and call climate change things like “perhaps the world’s most fearsome weapon of mass destruction” (John Kerry), requiring the expenditure of trillions of dollars. I think that is verging on grotesque in a world full of war, hunger, disease and poverty. It also means that environmental efforts get diverted from more urgent priorities, like habitat loss and invasive species.

#### Our authors aren’t climate deniers — the IPCC is on *our* side.

Wente 14 — Margaret Wente, Columnist for *The Globe and Mail*, Director of the Energy Probe Research Foundation, holds an M.A. in English from the University of Toronto, 2014 (“Don’t bash the global lukewarmers,” *The Globe & Mail*, April 10th, Available Online at <http://www.theglobeandmail.com/opinion/dont-bash-the-global-lukewarmers/article17906081/>, Accessed 07-17-2016)

What if global warming isn’t an existential threat to the planet after all? What if many of its impacts are more or less manageable? Wouldn’t that be a relief?

Well, no. Not if you’re Greenpeace or the Sierra Club, or any number of environmental activists who need prophecies of doom to raise money. Not if you’re a climate scientist who depends on a steady stream of research funding to stay in business. Not if you’re a politician who likes to bash the other side for its appalling lack of action.

But that’s what the UN’s own panel on climate change suggests. Compared to its last report in 2007, the new Intergovernmental Panel on Climate Change report released last week is notably more subdued. Gone are the melting Himalayan glaciers, the monster hurricanes, the millions of climate refugees fleeing floods and drought. It says no species have yet been extinguished by climate change. And, it says, there’s a lot we can do to adapt.

You won’t have caught this nuance in media reports, which relied on a far more dramatic 49-page summary. Worst Is Yet To Come, said a headline in the New York Times. The CBC, for instance, used the report as an excuse to bash the Harper government for not restricting coal exports.

Almost all reporting about climate change is binary: There are warmers and deniers, and few in between. But the real fight isn’t like that at all, observes climate critic Matt Ridley. It’s between warmers and lukewarmers – people who believe climate change is an urgent, existential threat and those who think it’s not that big a deal.

Unfortunately, the warmers have done their best to lump the lukewarmers in with the deniers. When Richard Tol, a Dutch professor of the economics of climate change, withdrew from the IPCC writing team because he thought the tone was too alarmist, he was denounced and ostracized. His belief is that by the end of the century, the overall effects of climate change will be damaging – but that warming will also have some positive effects that shouldn’t be ignored. “The idea that climate change poses an existential threat to humankind is laughable,” he wrote in the Financial Times.

“I don’t think anybody really knows what’s happening,” James Lovelock, the eminent environmental scientist, told the British Broadcasting Corp. last week. “They just guess.” He told the Guardian that environmentalism “has become a religion,” and doesn’t pay enough attention to the facts.

Much of the public seems to agree. The number of Americans who think the news media are exaggerating global warming has grown to 42 per cent, according to Gallup – and the fear-based approach has clearly backfired, Ted Nordhaus and Michael Shellenberger of the Breakthrough Institute wrote recently in The New York Times. If anything, it increases people’s skepticism about the problem. It’s not hard to figure out why. Cry “wolf” too often, and people start to tune you out.

For what it’s worth, this is not an argument for doing nothing. It would be good to reduce our dependency on fossil fuels. Energy companies should be held to high environmental standards. Yet no matter what we do, the world is not about to give up fossil fuels, and cheap, reliable substitutes are a long way down the road.

Personally, I wish we’d spend more time on real catastrophes today than on hypothetical ones half a century from now. Perhaps the worst environmental problem in the world is indoor air pollution from cooking fires, which kills 4.3 million people a year prematurely – mostly women and children. Maybe we could do something about that.

I can’t predict what the temperature will be 50 years from now, and neither can anybody else. What I will predict is that historians will look back and marvel that we got so hysterical about global warming. The planet is resilient. And people are, too.

### U.S.-China Cooperation Now

#### U.S.-China climate cooperation is strong now.

Ewing 15 — J. Jackson Ewing, Adjunct Research Fellow in International Relations and Head of the Environment, Climate Change, and Food Security Program at the S. Rajaratnam School of International Studies at Nanyang Technological University (Singapore), holds a Ph.D. in Environmental Security and an M.A. in International Relations from Bond University (Australia), 2015 (“Why China and the U.S. Have Found Common Purpose on Climate Change,” *U.S. News & World Report*, December 10th, Available Online at <http://www.usnews.com/news/articles/2015/12/10/why-china-and-the-us-have-found-common-purpose-on-climate-change>, Accessed 07-17-2016)

Over the past year, the United States and China forged a climate change partnership that would have been almost unthinkable not long ago. Not only have both countries committed to emissions reduction and sustainable energy goals of substantial ambition, they are pursuing those goals in concert.

This bilateral climate cooperation has been crucial to the UN climate summit in Paris and will continue to be so after any agreements are signed. Following years at loggerheads, the converging positions of the world’s two largest emitters are becoming invaluable components of future climate response actions.

So why is this happening?

A combination of domestic, bilateral and international forces help explain the transformation, and reveal its potential and continuing challenges.

#### U.S.-China climate cooperation is locked in — it’ll survive tensions on other issues.

Ewing 15 — J. Jackson Ewing, Adjunct Research Fellow in International Relations and Head of the Environment, Climate Change, and Food Security Program at the S. Rajaratnam School of International Studies at Nanyang Technological University (Singapore), holds a Ph.D. in Environmental Security and an M.A. in International Relations from Bond University (Australia), 2015 (“Why China and the U.S. Have Found Common Purpose on Climate Change,” *U.S. News & World Report*, December 10th, Available Online at <http://www.usnews.com/news/articles/2015/12/10/why-china-and-the-us-have-found-common-purpose-on-climate-change>, Accessed 07-17-2016)

Some Welcome Common Ground

Bilaterally, American and Chinese diplomats have come to see climate change cooperation as low-hanging fruit in an agenda otherwise brimming with strategic tension. From currency markets and competitive free trade groupings to maritime navigation and the rise of China’s military, the relationship does not lack for wicked problems.

Climate change used to be just another avenue for strategic posturing, with China clinging to its status as a developing country with little culpability for the problem, and the U.S. justifying its inflexibility through China’s inaction. Those days have passed, at least for now.

Beijing and Washington now see opportunity in the climate problem, and view it as a refreshingly non-zero sum game. They recently formed and now cofund the U.S.-China Clean Energy Research Center, with a mandate extending through 2020, and are pursuing technical cooperation on issues from carbon capture and sequestration to sustainable urban infrastructure.

These connections feed into growing business ties, manifested most publicly through the annual U.S.-China Clean Energy Forum. Such ties create incentives that are likely to keep climate cooperation from being a flash in the pan.

### China Solving Now

#### China is fully committed to substantial emissions reductions for self-interested reasons — they’re already a climate leader.

Henderson et al. 16 — Geoffrey Henderson, ChinaFAQs Project Specialist at the World Resources Institute, Graduate Student Researcher at the University of California-Santa Barbara, holds a B.A. in Political Science from Haverford College, with Ranping Song, Developing Country Climate Action Manager at the World Resources Institute, former China Campaign Manager for The Climate Group in Beijing, holds a Masters in Public Administration from the Wagner School of Public Service at New York University, and Paul Joffe, Senior Foreign Policy Counsel at the World Resources Institute, former Senior Director of International Affairs at the National Wildlife Federation, former Deputy Assistant Secretary and Acting General Counsel at the Commerce Department during the Clinton Administration, holds a J.D. from Yale Law School, 2016 (“5 Questions: What Does China’s New Five-Year Plan Mean for Climate Action?,” World Resources Institute, March 18th, Available Online at <http://www.wri.org/blog/2016/03/5-questions-what-does-chinas-new-five-year-plan-mean-climate-action>, Accessed 07-17-2016)

Why are these targets important?

The new targets in the plan underscore the fact that the country is no longer merely concerned with the pace of growth, but with the quality of growth. China’s efforts on sustainable development and climate action are driven by strong national interests, such as concern about the impacts of climate change, hazardous air pollution and energy security. There’s also evidence that China’s leaders recognize the economic benefits of clean energy, and that new drivers will be required for the economy to continue its rapid economic growth.

To achieve these targets, the plan calls for controlling emissions from energy-intensive industries like power and steel, building a unified national carbon emissions trading market, implementing emissions reporting and verification for key industries, and establishing a green finance system, among other measures. The plan also states that China will be actively involved in the global effort to address climate change, including advancing its own contribution, and will deepen its bilateral dialogue with other countries. These efforts will provide momentum toward stronger climate action both in China and internationally.

#### China is locked in to substantial emissions reductions — it’s a byproduct of their new development strategy.

Ewing 15 — J. Jackson Ewing, Adjunct Research Fellow in International Relations and Head of the Environment, Climate Change, and Food Security Program at the S. Rajaratnam School of International Studies at Nanyang Technological University (Singapore), holds a Ph.D. in Environmental Security and an M.A. in International Relations from Bond University (Australia), 2015 (“Why China and the U.S. Have Found Common Purpose on Climate Change,” *U.S. News & World Report*, December 10th, Available Online at <http://www.usnews.com/news/articles/2015/12/10/why-china-and-the-us-have-found-common-purpose-on-climate-change>, Accessed 07-17-2016)

China's Pollution Crisis

In China, conventional pollution has moved environmental issues up the list of development priorities and made them part of the country’s core national strategic calculations.

The scale and scope of protests against air pollution and environmental decline – which by some measurements lead to 1.6 million deaths per year – are on the rise, and Chinese leadership is responding through rhetoric and practice.

President Xi called poor air quality Beijing’s “most prominent” challenge in 2014, while a top climate adviser deemed an acute pollution episode in the capital “unbearable.”

In response, the metrics for measuring local bureaucratic success and promotions through party ranks emphasize environmental performance more than ever before. Punitive measures against polluters are gaining strength, and efforts to transform energy systems are accelerating through rapid expansions in solar, wind and nuclear sectors.

Such measures have the corollary effect of reducing greenhouse gas emissions, which has changed the ways that Chinese leadership views international pressure to act on climate change.

Outside pressures to reduce China’s carbon emissions used to be viewed as anathema to the country’s development needs, and a distraction from its core business of wealth generation and societal development. They are now seen as opportunities for gaining partnerships, technical support and finance to help China transition toward a cleaner energy future. This includes expanding China’s manufacturing and export of clean-energy technologies, which have strong economic growth potential.

Xi’s China thus looks to the international climate arena for help addressing its domestic energy transition and pollution reduction goals. That the measures taken will also reduce climate risks is an added bonus.

#### China’s new Five-Year Plan locks-in emissions reduction targets — they’ll follow-through.

Henderson et al. 16 — Geoffrey Henderson, ChinaFAQs Project Specialist at the World Resources Institute, Graduate Student Researcher at the University of California-Santa Barbara, holds a B.A. in Political Science from Haverford College, with Ranping Song, Developing Country Climate Action Manager at the World Resources Institute, former China Campaign Manager for The Climate Group in Beijing, holds a Masters in Public Administration from the Wagner School of Public Service at New York University, and Paul Joffe, Senior Foreign Policy Counsel at the World Resources Institute, former Senior Director of International Affairs at the National Wildlife Federation, former Deputy Assistant Secretary and Acting General Counsel at the Commerce Department during the Clinton Administration, holds a J.D. from Yale Law School, 2016 (“5 Questions: What Does China’s New Five-Year Plan Mean for Climate Action?,” World Resources Institute, March 18th, Available Online at <http://www.wri.org/blog/2016/03/5-questions-what-does-chinas-new-five-year-plan-mean-climate-action>, Accessed 07-17-2016)

China has officially unveiled its 13th Five-Year Plan, which will guide the country’s economic and social development from 2016 through 2020. This latest edition builds on progress made over the last five years, and makes clear that environmental stewardship is an increasingly integral component of China’s development.

The plan lays out targets and measures to address several sustainability challenges—including climate change, air pollution, water, urbanization, transportation and more. The new plan’s high-level targets and policies will continue to strengthen China’s efforts to shift to a more sustainable model of growth and deliver on its climate commitments. Here’s a look at the highlights and importance of the plan for China’s action on energy and climate change:

What are the highlights of the plan for energy and climate?

China plans to develop its economy by more than 6.5 percent per year over the next five years. Under the plan, this growth will increasingly come from services—which will rise from 50.5 to 56 percent of the economy by 2020—and more innovative and efficient manufacturing. These sectors typically have lower air pollutant and greenhouse gas emissions than China’s traditional growth engines, like heavy industry and infrastructure construction.

The plan sets out a new round of targets for the carbon and energy intensity of China’s economy. With China’s new target for an 18 percent reduction in carbon-intensity from 2015 levels, we estimate that China will actually reduce its carbon intensity 48 percent from 2005 levels by 2020, exceeding its original target of a 40-45 percent reduction by that year. It will also be a first step toward achieving its Paris Agreement pledge to reduce carbon intensity 60 to 65 percent by 2030. The plan also includes a goal to reduce energy intensity by 15 percent, suggests that China’s most-developed eastern regions will be the first to peak their carbon emissions, and builds on efforts to increase China’s forest stock.

[Graph Omitted]

For the first time, the plan includes quantified guidance on energy consumption control, stating that China should limit its energy use to 5 billion tons of standard coal equivalent. As energy is the largest source of carbon emissions, limiting energy consumption is an important component of China’s implementation of its Paris commitments. This guidance seems to be an effort to ensure an upper limit on energy consumption, as there are signs that China’s energy use could be lower than 5 billion tons in 2020. Growth in China’s energy use has slowed in recent years, and China has the potential to achieve its economic goals with less energy through energy efficiency initiatives.

#### China already exceeded its climate goals from the last Five-Year Plan.

Henderson et al. 16 — Geoffrey Henderson, ChinaFAQs Project Specialist at the World Resources Institute, Graduate Student Researcher at the University of California-Santa Barbara, holds a B.A. in Political Science from Haverford College, with Ranping Song, Developing Country Climate Action Manager at the World Resources Institute, former China Campaign Manager for The Climate Group in Beijing, holds a Masters in Public Administration from the Wagner School of Public Service at New York University, and Paul Joffe, Senior Foreign Policy Counsel at the World Resources Institute, former Senior Director of International Affairs at the National Wildlife Federation, former Deputy Assistant Secretary and Acting General Counsel at the Commerce Department during the Clinton Administration, holds a J.D. from Yale Law School, 2016 (“5 Questions: What Does China’s New Five-Year Plan Mean for Climate Action?,” World Resources Institute, March 18th, Available Online at <http://www.wri.org/blog/2016/03/5-questions-what-does-chinas-new-five-year-plan-mean-climate-action>, Accessed 07-17-2016)

What are other signs of China’s progress on climate to date?

China has already made substantial progress under the 12th Five-Year Plan, surpassing its targets for energy intensity (down 18.2 percent) and carbon intensity (down 20 percent), according to official figures. Services’ share of China’s economy has risen in recent years, eclipsing manufacturing’s share in 2013. Consumption of coal leveled off in 2014, and output in heavy industries like steel and cement has begun to decline. Further, China is investing in clean energy and installing wind and solar power at world-record levels, making the country the global leader in solar power capacity last year.

#### China’s commitment to reduce emissions is structural and long-term.

Henderson et al. 16 — Geoffrey Henderson, ChinaFAQs Project Specialist at the World Resources Institute, Graduate Student Researcher at the University of California-Santa Barbara, holds a B.A. in Political Science from Haverford College, with Ranping Song, Developing Country Climate Action Manager at the World Resources Institute, former China Campaign Manager for The Climate Group in Beijing, holds a Masters in Public Administration from the Wagner School of Public Service at New York University, and Paul Joffe, Senior Foreign Policy Counsel at the World Resources Institute, former Senior Director of International Affairs at the National Wildlife Federation, former Deputy Assistant Secretary and Acting General Counsel at the Commerce Department during the Clinton Administration, holds a J.D. from Yale Law School, 2016 (“5 Questions: What Does China’s New Five-Year Plan Mean for Climate Action?,” World Resources Institute, March 18th, Available Online at <http://www.wri.org/blog/2016/03/5-questions-what-does-chinas-new-five-year-plan-mean-climate-action>, Accessed 07-17-2016)

What challenges remain?

Along with the above-mentioned carbon-intensity pledge, China’s Paris commitments include a target to peak carbon emissions in 2030 and to make best efforts to peak earlier. While making progress, the country’s effort to decouple emissions from economic growth at its present stage of development faces continuing uncertainties. For instance, China’s work to further strengthen measures to improve efficiency and reduce demand in buildings and transportation (including through efforts on high-speed rail laid out in the plan) will be important to offset potential emissions growth from China’s trends toward increased urbanization and vehicle ownership.

Studies make clear that the commitments made by countries do not go far enough to limit warming to below 2°C and avoid some of the worst impacts of climate change. In Paris, countries agreed to come back to the table by 2020 to review their targets. If significant progress were made on addressing remaining challenges during the next five years, then China could be in a position to revise its pledge.

At the same time, the debate over the precise timing of China’s emissions peak may be less important than its continuing efforts to build a foundation for deep emissions reductions over the long term. China is continuing to develop and implement measures that can help achieve this goal, such as limits on coal and energy use, energy efficiency improvements, renewable energy deployment and grid integration, carbon pricing, and steps to shift toward a cleaner model of development. The energy and other sectoral plans following the national Five-Year Plan will provide further opportunities to make progress on these efforts.

#### China has made emissions reductions the core of its new growth strategy.

Stern 16 — Nicholas Stern, I.G. Patel Professor of Economics and Government at the London School of Economics and Political Science, Co-Chair of the Global Commission on the Economy and Climate, President of the British Academy, Fellow of the Royal Society, former Chief Economist of the European Bank for Reconstruction and Development, former Chief Economist and Senior Vice President at the World Bank, 2016 (“China’s green revolution goes global,” *Financial Times*, July 8th, Available Online at <https://next.ft.com/content/4644c883-0893-3add-b1e3-63a7dda2e275>, Accessed 07-17-2016)

China’s 13th Five-Year Plan, for the period from 2016 to 2020, is guided by five principles: innovation, coordination, greening, opening up and sharing. When Zhang Gaoli, vice-premier, described these principles this year to a group of overseas business and academic leaders at the China Development Forum, he spent longest on ‘greening’, providing a clear indication of the importance being placed on green development for China’s future growth.

In a conversation that followed, Li Keqiang, China’s premier, told Mark Fields, chief executive of the Ford Motor Company, that sales of gasoline-powered cars are likely to be overtaken within the next two decades in China by those of “new energy vehicles”. Both the emphasis and the exchange are indicative of China’s plans for a clean economy, shifting away from carbon-intensive industries like iron and steel towards services, while seeking to maintain a robust 6.5 per cent GDP growth rate – the envy of many developed countries.

The old growth model based on manufacturing exports lifted millions of Chinese out of poverty and made China an economic superpower. But it also brought challenges including a coal-dominated energy mix that was damaging to people’s health. Some recent estimates put the cost of damage to health from poor air quality, much of which is associated with burning fossil fuels, at around 10 per cent of China’s GDP.

Now, however, China’s policymakers are going to show the world decisively that climate action and economic growth go hand-in-hand. The 13th plan intends to move the country up the economic value chain towards consumption patterns that are less resource-intensive. The plan also makes explicit reference to managing the structural transition for workers in sectors such as coal, steel and iron, where production will be reduced to eliminate over-capacity.

#### China has already made substantial progress.

Stern 16 — Nicholas Stern, I.G. Patel Professor of Economics and Government at the London School of Economics and Political Science, Co-Chair of the Global Commission on the Economy and Climate, President of the British Academy, Fellow of the Royal Society, former Chief Economist of the European Bank for Reconstruction and Development, former Chief Economist and Senior Vice President at the World Bank, 2016 (“China’s green revolution goes global,” *Financial Times*, July 8th, Available Online at <https://next.ft.com/content/4644c883-0893-3add-b1e3-63a7dda2e275>, Accessed 07-17-2016)

So what does a green China mean for its own economic growth and for the world?

First, the climate agenda has taken firm root, with major positive shifts already underway. China will likely over-deliver on its commitments for 2020, which were made at the United Nations climate change summit in Cancún, Mexico, in December 2010. Researchers estimate that China is already on track to exceed its target of a 40-45 per cent reduction in carbon intensity from 2005 levels by 2020 and the reduction could be as high as 50 per cent. Next year will also see the world’s largest emissions trading scheme being implemented across China, when the seven pilot trading systems currently in place expand to a national level. And recent research suggests that China’s overall emissions will peak well before the year 2030 as indicated as part of its national pledge in the run-up to the United Nations climate change summit in Paris last December.

#### China is locked-in to a renewable energy transition — emissions are falling.

Stern 16 — Nicholas Stern, I.G. Patel Professor of Economics and Government at the London School of Economics and Political Science, Co-Chair of the Global Commission on the Economy and Climate, President of the British Academy, Fellow of the Royal Society, former Chief Economist of the European Bank for Reconstruction and Development, former Chief Economist and Senior Vice President at the World Bank, 2016 (“China’s green revolution goes global,” *Financial Times*, July 8th, Available Online at <https://next.ft.com/content/4644c883-0893-3add-b1e3-63a7dda2e275>, Accessed 07-17-2016)

Second, reaching the renewable energy targets that China declared in the run-up to Paris translates into a rapid increase in clean energy investment. China’s renewable energy investment in 2015 was $110bn: a 17 per cent increase from the year before and nearly double the US renewable investment level. China has installed more wind capacity – 145 GW – than that in the US, Germany, and India combined. Utilisation is also rising: as part of the total primary energy consumption, the share of non-fossil fuels has also increased from roughly 8 per cent in 2010 to 12 per cent in 2015. Recent data suggest that these investments, as well as successful efforts to reduce coal use, may have helped carbon dioxide emissions slow, or even fall, last year. Indeed, China’s coal consumption seems to have reached its peak in 2014.

### India Key

#### India is more important than the U.S. and China.

Joyce 16 — Christopher Joyce, Correspondent on the Science Desk at National Public Radio, 2016 (“Can The U.S. And China Keep Their Climate Pledges?,” All Things Considered — NPR, April 21st, Available Online at <http://www.npr.org/sections/thetwo-way/2016/04/21/474690936/can-the-u-s-and-china-keep-their-climate-pledges>, Accessed 07-17-2016)

What the U.S. and China do is critically important now, but ultimately their efforts won't be enough to stop climate change. Other countries matter as well — in particular, India. India's emissions are growing fast, and while its government pledged in Paris to shift to renewable energy as fast as the country can, it's not giving up fossil fuels such as coal either — not with hundreds of millions of people still without electricity. Over the long haul, India's emissions could surpass those from the U.S. or China.

"What pathway India takes will go a long way to saying where we end up in 10 to 20 years," Jackson says, "along with what the U.S. does and what China does."

\* Jackson = Rob Jackson, a climate scientist at Stanford University

#### Growing emissions in India can negate progress in the U.S. and China.

Mishra 15 — Anish Mishra, Senior Vice President of IPB NRI Business at Citibank NA, UAE, holds a degree from the Indian Institute of Management, Indore, 2015 (“Why India must take climate change seriously,” *Japan Times*, October 29th, Available Online at <http://www.japantimes.co.jp/opinion/2015/10/29/commentary/world-commentary/india-must-take-climate-change-seriously/>, Accessed 07-17-2016)

The United Nations Department of Economic and Social Affairs has projected that by 2028 India will be the world’s most populous country, with 1.45 billion people. According to the International Monetary Fund, India is the world’s faster growing economy with GDP growth of 7.5 percent, ahead of China. As of today, nearly half a billion Indians do not have full access to electricity supply and running water.

If anyone were to listen to the aspirations and promises of Indian politicians during election rallies, it would appear very clear that this great democracy is still struggling with poverty and providing its people with their basic needs. The ruling Bharatiya Janata Party (BJP) was not surprisingly handed a clear mandate for economic development. As India rapidly progresses toward a bright future, its people will experience dramatic improvements in their standards of living, with millions of Indian leaping out of poverty every year. India will have a growing middle class with high aspirations, and by extension rising consumption and production.

There can be little doubt that as Indians get richer, owning more cars and electrical appliances, India’s carbon emissions rate will rise. Currently, the World Bank has it at 1.67 metric tons of carbon dioxide per capita, compared with China’s 6.19 metric tons per capita and America’s colossal 17.56 metric tons per capita. This suggests the potential rise in India’s CO2 emissions.

As an emerging economy with massive socioeconomic complexities and low per capita carbon emission rates, climate change may seem the very least India’s concerns. Yet if India overlooks the importance of climate change, the consequences could be dire. Given India’s enormous population, a marginal increase in per capita CO2 emissions will produce a huge increase in global CO2 emissions.